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THIRTEENTH ANNUAL REPORT

OF THE

PUBLIC WATER BOARD

OF THE

CITY OF LYNN,

FOR THE YEAR ENDING DECEMBER 31, 1884.

LYNN, MASS.:
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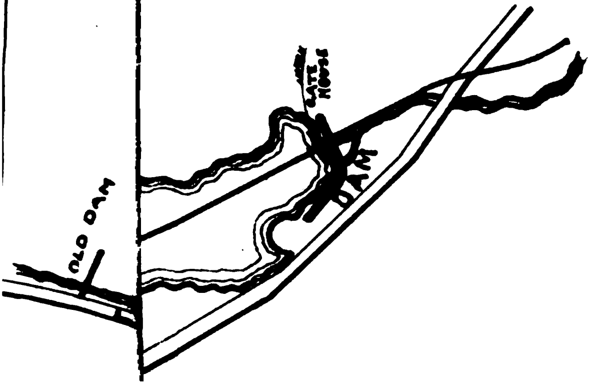

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OFFICERS FOR 1884.

EDWIN WALDEN, *President*,*
For two years.

ALBERT A. DAVIS,
For four years.

THOS. B. NEWHALL,
For three years.

JOSEPH M. ROWELL,
For one year.

D. H. SWEETSER, *President*,†
For five years.

Supt. and Clerk,
DANIEL WALDEN.

Water Registrar.
FRANK McCULLOUGH.

Pumping Engineer.
WM. H. MESSINGER.

Foreman of Piping,
EDWIN MAXWELL.

Foreman of Services,
GEORGE SANBORN.

Inspectors,
WINSLOW J. ROWELL, WILLIS L. SNOW, J. FRANK POOL.

OFFICERS FOR 1885.

D. H. SWEETSER, *President*,
For four years.

ALBERT A. DAVIS,
For three years.

THOS. B. NEWHALL,
For two years.

AMOS. F. BREED,
For one year.

NATHAN D. C. BREED,
For five years.

Supt. and Clerk,
DANIEL WALDEN.

Water Registrar,
FRANK McCULLOUGH.

Pumping Engineer,
WM. H. MESSINGER.

Foreman of Piping,
EDWIN MAXWELL.

Foreman of Services,
GEORGE SANBORN.

Inspectors,
WINSLOW J. ROWELL, WILLIS L. SNOW, J. FRANK POOL.

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* Resigned June 1. AMOS F. BREED elected to fill the unexpired time.
† Elected President June 30.

ANNUAL REPORT

Office of the Public Water Board,
January 12, 1885.

The Public Water Board hereby present to the City Council their Thirteenth Annual Report, together with the reports of the Superintendent of the works, and of the Water Registrar; to which we would refer for much valuable and interesting information concerning the condition of this department.

At the annual organization of the board in January, Edwin Walden was elected President, Daniel Walden Superintendent, and Clerk of the board, and Frank McCullough Water Registrar. In June Edwin Walden resigned as a member of the board, and Amos F. Breed was elected by the City Council to fill the vacancy.

The retirement from the board of President Walden was a serious loss to this department. His long experience and thorough knowledge on all questions relating to public water supplies gave to his judgment and opinions a value that can hardly be over estimated. Elected as its President when the board was first organized in 1871, his time and services have since been freely and gratuitously rendered; and to his efforts and the great interest he has ever taken in all matters relating to our water supply, the success of our system is largely due. Our new supply comes from the sources he always earnestly advocated. In his first annual report to the City Council, twelve years ago, he presented the scheme for supplying our city with water from the tributaries of Saugus river. The adoption of these sources, after years of controversy, verifies the value of his judgment and opinions.

RECEIPTS AND EXPENDITURES.

By the Registrar's report it appears that the revenue for 1884 was $114,903.86. The interest payments were $60,325.99; the cost of maintenance, $27,842.99; total, $88,168.98; showing a surplus of $26,734.88, to be carried to the sinking fund for the extinguishment of the water debt.

The revenue shows an increase over 1883 of $16,010.32. The cost of maintenance exceeds that of the previous year $6,386.85. The increase in maintenance is accounted for by the large bills of repairs to the pumping engine, amounting to $6,331.70, and the damages paid on account of the burst of the main pipe on Market street. These items, although they may be called extra and unusual expenses, were charged to maintenance for the year.

COST OF THE WORKS.

Total gross cost of the works to Jan. 1, 1884		$1,246,858 85
Add construction account for 1884		97,860 38
Total gross cost of the works to Jan. 1, 1885		$1,344.719 23
Less receipts for pipe, labor, etc.	$47,366 23	
Less premium on bonds sold	9,750 00	
Less income in excess of interest payments and cost of maintenance*	120,831 31	
		$177,947 54
Total net cost of the works, Jan. 1, 1885		$1,166,771 69

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*This amount includes no appropriations to Water Loan Sinking Fund, made by the City Council, or earnings of the fund since it was established.

OUR NEW SOURCES.

The order of the City Council passed Sept. 5, 1883, providing for constructing a tunnel and canal between Saugus river, at Howlett's dam, and Birch Pond, and laying a pipe through said pond, in accordance with the plan of Phinehas Ball, C. E., has been executed, with the exception of raising the dam at Birch Pond. The contracts for this work were made by our immediate predecessors, the board of 1883, and were well underway at the commencement of the present year.

Unfortunately the state of Mr. Ball's health has been such that he was not able to personally superintend the execution of his plan, which has been carried out under the supervision of Mr. W. C. Boyce, who has faithfully looked after the city's interest.

The cost of the work, as will be seen, has far exceeded the original estimates, and there are some large claims in connection with the work that have not yet been settled. The many questions calling for settlement, and the complications requiring adjustment, during the work of construction, have made continual calls upon the time and and services of the board, who have endeavored to faithfully execute the work entrusted to them.

It is yet too early to fully determine the comparative value of this method of utilizing the waters of Hawkes and Penney Brooks. Under the act of the Legislature, we can take the waters of Saugus river only when there is a surplus above fifteen millions of gallons daily flowing at Pranker's dam. When this quantity of water flows in the river, more water is running in Hawkes and Penney Brooks than we can take care of under this system; therefore we leave out the river in considering this scheme, for its waters are available only when we have no use for them.

As the quantity of water required for the city's consumption from day to day is all that is available from the brooks, it is self evident that with no storage basins, much of the water must run to waste, and but a small proportion of the storm waters and spring freshets can be made available.

What portion of the year the brooks will yield enough to supply our consumption remains to be shown. We hope it will be sufficient for five months at least. While we know that the yield in the course of a year is enough to meet the demands of a population double the size of ours, yet the supply is so intermittent and variable that storage basins are necessary to properly utilize it.

Already we hear complaints of the color and taste of the water. While we believe that the nature of the water-shed where it is collected guarantees its freedom from impurities of a harmful character, the slight discoloration and woody taste are unavoidable when the water flows direct from the brooks to the pumping well. without being subject to the purifying influences of the sun and air in storage basins.

This scheme was designed as an economical method of utilizing these waters; but as the total cost, when all the bills are paid, bids fair to be nearly double the original estimates, it has in this respect proved a disappointment.

BIRCH POND DAM.

That part of the order of the City Council referred to, requiring the raising of the dams at Birch and Breed's Ponds, has not yet been executed. Owing to the delay in completing the tunnel, no use of the waters could be made in the early part of the season, when they were running freely. This required the husbanding of all our resources, and we had to rely on Breed's and Birch Ponds to carry us through the summer and fall. Therefore not till August was it deemed advisable to draw off Birch pond in order to make a thorough examination of the dam preparatory to either raising it or building a new one.

As soon as practicable, plans and estimates were prepared and submitted to the City Council for approval. It was already late in the season to commence a work of this importance, and the delay of the City Council in considering the matter made it a physical impossibility, by awaiting their final action; to construct the dam this season. As soon as practicable, the work on the dam will be commenced.

As much popular misapprehension exists in regard to the raising of these dams, we will state that it is not to provide storage for the water which comes through the tunnel, for with the water in Birch Pond at a height of seven feet, if the connections with the tunnel are not closed, the water will flow back through the tunnel and canal into Saugus river, the water in the pond being at a higher level than the brooks. As the water in the pond should never be drawn below seven feet, it will be seen that practically it furnishes but little storage for the water from the brooks.

The object in raising these dams is to furnish ponds of greater depth, to be filled with water from their own watersheds during the time we are using the water from the brooks.

INSPECTION.

Early in the year an addition was made to the number of inspectors, and they were ordered to make a thorough examination of all fixtures in use by water takers. The result has been that a large number of fixtures have been found, of which there was no record on the books of the Registrar, and which were not paying water rates. Additional bills were sent out for one hundred and ninety-four families, six hundred and fifty faucets, seventy-nine bath-tubs and one hundred and five water-closets, of which the Registrar had no knowledge until they were discovered by the inspectors.

One of the regulations of the board requires all water-takers to report any additional use of water. These facts show that in many cases they fail to report, and, if they are not discovered by the inspector, the city loses the rates.

The passage of an ordinance by the City Council requiring all plumbers and pipe-fitters to be licensed before they can make any connections with the city water works, under such conditions as will require them to report to the board when any additional water fixtures are put in by them, would save this loss, and secure the payment of rates for these fixtures. Such licenses, if granted to practical plumbers only, would also save much loss and inconvenience resulting from poor workmanship in connection with our water supply, and we would respectfully recommend the passage of such an ordinance, if the authority exists. If it is found that the City Council has no power to grant such licenses, we would suggest the propriety of petitioning the Legislature for the passage of an act giving the requisite authority.

WATER RATES.

It will be seen that the income for the use of water is constantly increasing, and notwithstanding the additional construction calls for larger appropriations to meet the interest on the water debt, the net income is steadily growing from year to year. In view of this fact, we shall soon have to meet the question, whether we cannot safely reduce the rates to water takers, and so lessen one of the burdens which our people have to bear. As water sold by meter brings more per gallon than when sold by fixtures, the board this year made a beginning by reducing the meter rates ten per cent. Although the City Council refused to approve this reduction, we think the time will soon come when the demands for lower rates must receive consideration.

SWAMPSCOTT AND NAHANT.

These towns have already laid the pipes through their streets, with the expectation that we will furnish them with water. As they cannot construct and maintain a system of water works of their own, they naturally look to us for a supply. With our additional sources, we can furnish these towns water that would otherwise run to waste. With a surplus of water, as the cost of supplying them will only be the expense of pumping it into the reservoir, it requires no argument to prove that they will be profitable customers, and the receipts derived from them will go far towards paying the interest on the outlay for our new sources.

The only ground there can be for objecting to supply these towns with water, is the fear that our supply may prove insufficient to furnish them and meet the requirements of our own citizens. If, after the large expenditure we have just made to increase our water supply, the comparatively small quantity required by these communities will endanger our own supply, then our situation is a critical one, and we should take immediate steps to procure more water.

We believe, however, that such fears are groundless; that there will be an abundance not only for ourselves but for our neighbors, and we would therefore recommend that the board be authorized to contract with the towns of Swampscott and Nahant, to furnish them with water, by meter, upon such terms and conditions as may be mutually agreed upon, when it can be done without endangering the supply to our own citizens.

CONCLUSION.

When the City Council of 1883 decided to take the waters of Hawkes and Penney Brooks, it settled the water question, so far as the sources of supply were concerned. Although the future growth of our city may require some other method of utilizing the waters, we congratulate our citizens upon the final settlement of a question which has been pending ever since our public water works were established; one which has caused much bitter controversy, and has often been a disturbing element in our municipal affairs.

For the Public Water Board.

D. H. SWEETSER,
President.

REPORT OF THE WATER REGISTRAR.

D. H. Sweetser, Esq., President Public Water Board:

SIR: — In compliance with the City Ordinance, I take pleasure in presenting herewith the Report of the Water Registrar for the year ending Dec. 31, 1884.

SERVICES.

Whole number of services Jan. 1, 1884, 5,989; new services put in during the year, 516; total number Jan. 1, 1885, 6,505. New services let on during the year, 395; services shut off during the year for non-payment, 69; services let on by payment of rates and fine, 36; services let on for other parties, by change of ownership or occupancy, 5; shut off by request or for vacancies, 199; let on, premises re-occupied, 116; services discontinued during the year, 30. Services put in at East Saugus during the year, 4, making the whole number to Jan. 1, 1885, 63. Services put in at Swampscott during the year, 1, making the whole number to Jan. 1, 1885, 15.

The ratio of increase yearly in the number of services for the past nine years is as follows:

1876 . .	6.54 per cent.	1881 . .	10.25 per cent.
1877 . .	7.60 " "	1882 . .	9.92 " "
1878 . .	6.14 " "	1883 . .	10.80 " "
1879 . .	6.04 " "	1884 . .	8.62 " "
1880 . .	8.75 " "		

INSPECTION.

After the appointment by the board of an increased force of inspectors, a systematic and careful house-to-house inspection was begun on March 17th, for the inspection of the various fixtures in connection with the water service, and their condition of repair, and which was continued up to the first of August.

In one hundred and forty-two premises, there were found fixtures out of order and leaking, and the usual notice was left on the premises. These fixtures having been put in good order within the allotted time, there has been no shut-off for waste of water or non-compliance with notice.

As a result of the inspection, there were found one hundred and ninety-four families, six hundred and fifty faucets, seventy-nine bath-tubs, one hundred and five water closets, and two hundred and seventy-seven stables, from which the Water Department derived no revenue.

After a careful comparison of the water rates with the various uses of water in the premises, additional bills were made where due, and presented for payment, of the difference between the amount of the April bill and the amount due by the increase of fixtures, or uses of water, in such premises.

Many water-takers, finding their water-rates increased by the inspection, dispensed with various fixtures, thereby continuing their annual rate at about the same amount as before.

The total annual amount added to the income of the Water Department, as a result of the general inspection, is $6,022.00.

RECEIPTS FOR THE YEAR 1884.

For the use of water for all purposes	$113,520 56	
For fines, shutting-off and letting on	72 00	
For rent, grass, fruit, etc.	55 24	
Summons	184 80	
Extra pipe, labor, etc.	3,033 25	
Total receipts		$116,865 85

The whole amount of which has been paid into the city treasury, and the Treasurer's receipts taken therefor.

There is due and uncollected, on ordinary water rates, $1,024.51; meter rates, $4,142.58; extra pipe account, $706.82.

EXPENDITURES FOR YEAR 1884.

MAINTENANCE.

Salaries and office expenses	$5,058 24	
Repairs on services and meters	2,101 33	
Repairs on mains, hydrants and gates	1,430 89	
Repairs on engine-house	478 65	
Repairs on engines and boilers	492 42	
Repairing cylinders	3,873 76	
Lagging cylinders	1,965 52	
Repairs and labor, tubular wells	1,824 43	
Stable and workshop	1,197 04	
Pumping, wages, coal, oil, etc.	6,514 87	
Damages	1,946 76	
Birch Pond	39 23	
Breed's Pond	565 60	
New supply	157 64	
Reservoir	196 61	
Total maintenance		$27,842 99

CONSTRUCTION.

Mains, hydrants and gates	$14,929 22	
Services and court-mains	10,910 89	
Meters	200 52	
Engine-house	76 84	
Birch Pond	230 00	
New supply	71,512 91	
Total construction		$97,860 38

COMPARATIVE STATEMENT OF REVENUE FOR 1884.

Amount due and uncollected Jan 1, 1885	$5,167 09	
Amount collected for the year	113,832 60	
		$118,999 69
Deduct amount due Jan. 1st, 1884		4,095 83
Revenue for 1884		$114,903 86
Revenue for 1883		98,893 54
Increase of revenue for 1884		$16,010 32

STATEMENT OF INTEREST, MAINTENANCE AND REVENUE FOR 1884.

Revenue for 1884		$114,903 86
Interest for 1884	$60,325 99	
Maintenance for 1884	27,842 99	
		$88,168 98
Excess of revenue over interest and maintenance		$26,734 88

Following will be found the usual tables exhibiting the number of dwellings, families, stores, factories, etc., supplied with water; the class of premises to which meters are attached; the number and kinds of fixtures; the yearly revenue of the department, etc., etc.

Appended, also, is a detailed statement of the cost of the new supply.

Respectfully submitted,

FRANK McCULLOUGH,

Water Registrar.

TABLE

SHOWING THE NUMBER OF DWELLINGS, FAMILIES, STORES, FACTORIES, ETC., SUPPLIED WITH CITY WATER.

	1883.	1884.	Increase
Dwellings	5,338	6,041	703
Families	7,942	8,995	1,053
Boarding-houses	92	126	34
Hotels	11	12	1
Stores and shops	439	560	121
Offices	148	191	43
Restaurants and saloons	67	124	57
Stables	250	527	277
Stationary engines	115	115	
City fire engine-houses	4	4	
School-houses	29	31	2
Churches	16	17	1
Public halls and buildings	15	20	5
Printing offices	9	9	
Greenhouses	20	33	13
Bakeries	9	9	
Barber-shops	18	21	3
Planing-mills	4	4	
Machine and blacksmith shops	14		
Markets	8	8	
Banks	6	6	
Photographers	6	8	2
Public and drinking fountains	8	8	
Motors	10	10	
Laundries	4	7	3
Reservoirs	4	4	
Foundry	1	1	
Private fountains	16	17	1
Gas works	1	2	1
Steam heating works	1		
Old Ladies' Home	1	1	
City Hall	1	1	
City Hospital	1	1	
Alms-house	1	1	
Children's Home	1	1	
Post Office	1	1	
Hand-hose	1,206	1,587	381
Railroads	3	3	
Fire hydrants	527	543	16

STATEMENT

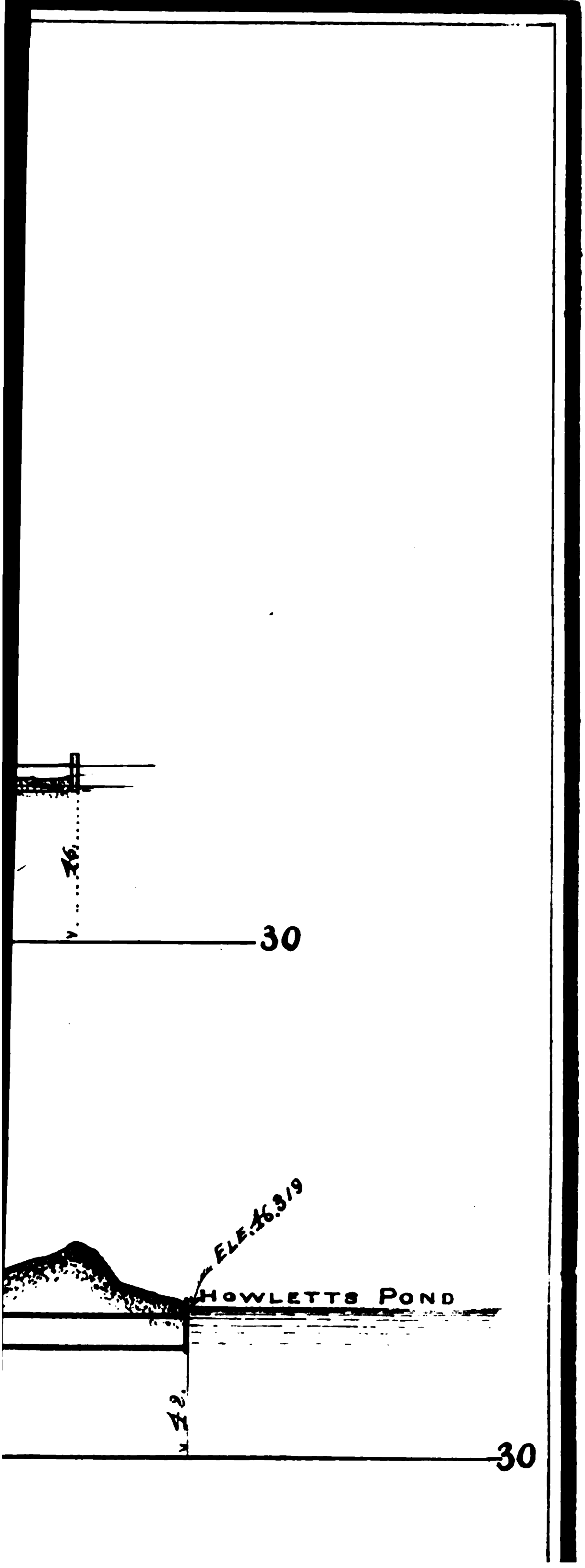
SHOWING THE CLASS OF PREMISES TO WHICH METERS ARE ATTACHED.

Class.	Size.								Total
	1-2	5-8	3-4	1	1 1-4	1 1-2	2	3	
Bath-rooms		1							1
Brewery			1						1
Brick-yards				2					2
Dwellings		1							1
Engines		2	10	17	2	4			35
Factories	3	12	37	30	1				83
Fire engine-house				1					1
Gas works						2			2
Halls and buildings		2	4	9					15
Hotels		1	1	1		1			4
Laundry		1							1
Medical laboratory				1					1
Printing office		1							1
Railroads		1	6	2			2	1	12
City stable				1					1
Livery stables		5	1						6
Tugs and vessels							1		1
Motors 5									
Totals	3	27	60	64	3	7	3	1	168

STATEMENT

SHOWING THE NUMBER AND KIND OF FIXTURES CONTAINED WITHIN THE PREMISES OF WATER TAKERS, ON DEC. 31, 1884, COMPARED WITH THE PREVIOUS YEAR.

Kind of Fixtures.	1883.	1884.	Increase.
Faucets	12,051	14,195	2,144
Bath tubs	670	928	258
Water closets	2,231	2,815	584
Urinals	82	179	97
Hand hose	1,206	1,587	381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STATEMENT

SHOWING THE YEARLY REVENUE OF THE DEPARTMENT SINCE THE FIRST INTRODUCTION OF WATER INTO THE CITY IN 1871.

From October 1, 1871, to January 1, 1872	$8,989 00
From January 1, 1872, to January 1, 1873	27,568 16
From January 1, 1873, to January 1, 1874	47,992 61
From January 1, 1874, to January 1, 1875	53,545 61
From January 1, 1875, to January 1, 1876	52,553 26
From January 1, 1876, to January 1, 1877	60,867 12
From January 1, 1877, to January 1, 1878	64,002 50
From January 1, 1878, to January 1, 1879	67,570 14
From January 1, 1879, to January 1, 1880	73,949 80
From January 1, 1880, to January 1, 1881	79,635 12
From January 1, 1881, to January 1, 1882	80,967 76
From January 1, 1882, to January 1, 1883	94,419 52
From January 1, 1883, to January 1, 1884	98,935 88
From January 1, 1884, to January 1, 1885	113,832 60
Total	$924,829 08

DETAILED STATEMENT

SHOWING COST OF THE WORKS TO JAN. 1, 1885.

Breed's Pond and land	$37,814 51	
Birch Pond and land	45,870 32	
Pipe conduit and right of way	43,785 98	
Reservoir and land	131,482 30	
Force main and land	24,614 00	
Engine-house and land	56,476 88	
Engines and boilers	71,998 00	
Mains, hydrants and gates	565,140 14	
Services and court mains	157,061 67	
Meters	6,964 83	
Work-shop and Stable	1,785 99	
Engineering	8,564 99	
Tubular wells	7,313 79	
New supply	119,177 58	
		$1,278,050 98
Less amount received for extra pipe, labor, etc.		47,366 23
Total net cost to date		$1,230,684 75

CONSTRUCTION NEW SUPPLY.

Engineering	$5,382 24	
Tunnel	38,075 21	
Canal	27,177 75	
Pipe through Birch Pond	43,116 46	
Gate-house and gates	4,387 57	
Screen chamber and house	1,038 35	
Total cost, exclusive of land taken or land damages		$119,177 58

REPORT OF THE SUPERINTENDENT.

D. H. Sweetser, Esq., President of the Public Water Board:

SIR:—In compliance with the city ordinance, I respectfully submit, herewith, the Annual Report of the Superintendent for the year ending Dec. 31, 1884.

NEW SUPPLY.

The work on the new supply, which was commenced in October, 1883, has been carried forward to completion. The laying of the thirty-inch pipe through Birch Pond was continued as fast as the nature of the work, and the inclement season of the year, would admit, and was finished and connected with the gate-house at the east end of the tunnel on the 2d of March, and the gate at the dam closed, in order to collect all the water possible in Birch Pond, as it was evident the tunnel would not be finished in season to obtain any water from the new source during the spring rains.

Work under the tunnel contract was continued through the winter, but the progress was slow and tedious, the caving of the sides and roof on two different occasions adding to the delay, so that the tunnel, with the necessary gate and screen chambers, was not finished ready to receive water through the canal from the new source till the first of October, within a few days of one year from the commencement of the work. The thirty-first day of October the first water from Hawkes and Penney Brooks was received in Birch Pond. It was not until the sixteenth of December that sufficient water had accumulated to allow of passing it from the tunnel, through the pipe in Birch Pond, direct to the pumping station for the supply of the city. Two serious leaks in the canal have been repaired. The accumulation of snow and ice has caused considerable trouble and inconvenience, but the warm weather of the last few days has cleared away these accumulations, and now we are getting the full supply of the city from the new source. The quantity pumped into the reservoir from that source up to January 1st has been 20,852,455 gallons. From the slight experience gained in the last two weeks, it is feared that with cold weather and heavy snows, the canal may be so blocked with ice and snow as to seriously interfere with its proper working, and prevent a sufficient quantity of water from reaching the well to supply the pump.

PONDS.

At the beginning of the year the ponds were very low, Birch Pond having been drawn off in order to lay the pipe which connects the new supply direct with the pumping station, and Breed's Pond containing but eight feet six inches of water. Heavy rains early in the month raised Breed's Pond rapidly, and Birch Pond furnished a large portion of the supply to the city. As soon as the pipe was connected with the tunnel the waste was stopped, and the water rapidly accumulated in both ponds. Early in the spring a connection was made near the pumping station, between the conduits leading from the two ponds to the pump well, by means of which water may be passed, in case of need, from one pond to the other, when the pump is not in use.

Surveys have been made at Birch Pond with reference to raising the dam and increasing the storage capacity of the pond. At Breed's Pond a survey has been made from the city's land at Oak street to the city's land on the north side of the pond, and a map drawn showing the line of flowage belonging to the city, and the encroachment made upon the land of private parties.

The curbing at the dam, and the wall at the waste-way, have been carefully pointed, the waste-way repaired and raised nine inches, and a new sill of cut stone for the flash-boards set. A trench has been excavated around the waste-way, down to the foundation of the wall, and filled with clay puddle, to stop several small leaks that existed and were gradually increasing. The abundant rains of the winter and spring filled Breed's Pond to its full capacity, and several million gallons were wasted over the flash-boards. Birch Pond, on account of its being drawn down to lay the pipe, was only filled to eleven and one-half feet. On the 20th of August, after using all the water we could from the pond, it was again drawn off to allow the contractors on the tunnel to finish their work, and also to make the necessary connection at the dam between the pipe through the pond and the pipe from the pond to the pumping-station, so that the water from the new supply could be carried direct to the pump-well when Birch Pond was filled above seven feet, as no water from the new sources can enter the pond when above that depth, except it be pumped.

The rainfall for the year has been 47.75 inches, a larger amount than for any year since a record has been kept, except in 1878. The yield of the water-shed, exclusive of the pond surfaces, owing to the very favorable conditions of the rainfall, has been 699,000,000 gallons, equal to 61.09 per cent. of the rainfall. The consumption for the year has been 636,504,382 gallons, an average of 1,739,083 gallons per day.

TUBULAR WELLS.

The pumping from the tubular wells was discontinued on the 29th of January. In September it was found that the supply was liable to come short, and on the 12th of that month pumping was again commenced for twelve hours per day, and on the first of October increased to twenty-four hours per day, and continued till the 24th of December, when the new sources beginning to furnish sufficient to supply the large engine, pumping from the wells was discontinued. The amount pumped from the wells during the year, allowing ten per cent. for loss of stroke and slip of valves, has been 74,426,562 gallons. The pump and the boiler have been put in proper condition to be ready for use.

RESERVOIR.

There has been no outlay on the reservoir this year, except for cleaning the weeds from the walk and road. The riprap on the inside slope of the embankment has settled slightly in some places, and will require some repairs next year.

PUMPING STATION.

The engine-room at the pumping station has received some long-needed repairs. The wood work has been refilled and varnished, and the walls painted in oil, thus giving the room a greatly improved appearance. The doors and sashes have been painted on the outside, and the building is now in good condition.

The repairs to the Leavitt engine, which were commenced last year by the I. P. Morris Co., of Philadelphia, have been completed, and the cylinders and steam pipes have been thoroughly covered with asbestos, and handsomely lagged with black walnut. The engine was started up on the 15th of February, and run without any covering on the cylinders till the 6th of June, when it was stopped for the purpose of covering and lagging the cylinders, and the Deane pump put in use for supplying the city. June 14th the high pressure piston of the left engine of the Deane pump broke, and work on the Leavitt engine had to be suspended, and that engine started up again. The Deane Co. promptly furnished a new piston, the repairs were completed, and the Deane again started on the 25th of June. On the 27th, it was again disabled by the breaking of the intermediate cylinder-head of the left engine. We were again indebted to the promptness of the Deane Co. in furnishing a new head, which was soon fitted and the engine put together, and started upon the 12th of July. Since then no further trouble has occurred.

The lagging of the Leavitt engine was finished, and that engine started on the 21st of August, and since that time it has continued to furnish the regular supply to the city, except for a short time while being cleaned and varnished. Since it was finished, it has surpassed its former high rate of duty, owing in part to being better protected from radiation than ever before, but mostly to the crack in the low-pressure cylinder, which took place in May, 1877, and was fully reported at that time, and which prevented the use of the steam jacket on that cylinder.

Both of the engines are now in good condition for service. For details of the work done by them during the year, please see Tables I. and II., hereto annexed. The cost of the repairs to the Leavitt engine, for two new cylinders, with expansive joints to the jackets, and all expense of setting up ready for work, was $4,001.65. For covering with asbestos and lagging, including new iron frame-work for securing the lagging, $2,092.97.

PIPES.

There has been laid, during the year, a total of 17,956 feet of pipe, of various sizes; 2,594 feet of thirty-inch pipe laid in the bottom of Birch Pond, in connection with the new supply; 36 feet of eighteen-inch pipe and one eighteen-inch gate, to connect the pipes from Breed's and Birch Ponds; 58 feet of ten-inch C. I. pipe laid in Ocean street, to connect with the pipes of the town of Swampscott; and a ten-inch gate set to control the water. The balance, 15,264 feet, has been laid in various streets and courts of the city, as distributing-pipes; in addition to which, 132 feet have been taken up and re-laid at a greater depth, to allow the new sewers to pass over them; and 380 feet have been taken up and lowered on account of lowering the grade of the street; thirty-five gates have been set on new work, and four have been set on pipes previously laid.

Seventeen hydrants have been set on new work, and one has been discontinued; three have been changed in their location and two raised. Five hundred and sixteen services have been put in, in the city, of an aggregate length of twenty-three thousand three hundred and sixty-eight feet, including a number of old services extended; four services have been put in in East Saugus, and one in Swampscott for the horse railroad, of an aggregate length of three hundred and ninety-three feet, which have been paid for by the parties ordering the same. Nine services have been lowered on account of lowering the street grade, and five have been taken up and re-laid.

Fifteen new meters have been set, and seven have been taken out and discontinued; twenty-three have been taken out, and cleaned, repaired and re-set. One hundred and twenty-two corporations, that have filled up with rust, have been dug up and drilled out; eleven new stop and waste cocks have been put in, to re-place broken ones; four hundred and twenty stop-boxes, found rotten, have been replaced with iron ones; twenty-six gate-boxes have been set in place of those decayed.

In trenching for pipes, two thousand one hundred and twenty-five lineal feet of ledge have been excavated, in different streets of the city; one hundred and four leaks in mains and service-pipes, and seventeen hydrants, have been repaired. Sixty-one feet of pipe was laid, one hydrant set, and five leaks repaired, for the town of Swampscott, at their expense.

August 15th a contract was made by the city to furnish the town of Swampscott with water for the extinguishment of fires, and the water was let into their pipes, to be used for that purpose only. For full details of the work done during the year, please see the annexed tables.

Respectfully submitted,

DANIEL WALDEN,

Superintendent.

TABLE I.

Record of the Leavitt Engine for the year ending December 31, 1884.

Date.	No. of pumping days.	Average pumping time per day.	Total pumping time per month.	Total number of revolutions per month.	Average revolutions per minute.	Coal Consumed.				Ashes and cinders.	Ashes and cinders.	No. of gallons pumped per month, allowing 4 per cent. for loss of action in the pump.	Average number of gallons pumped per pound of coal.	Average number of gallons raised 100 feet high per pound of coal.	Average head against the pump.	Average duty in lbs. of water, raised one foot high per 100 pounds of coal. Calculated on total coal consumed—no deduction for ashes.	Average duty calculated on total coal consumed, the ashes and cinders being deducted.	Oil.	Waste.
						Raising steam.	Pumping.	Banking.	Total.										
Month.	Days.	H. M.	H. M.	Rev.	Rev.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Per ct	Gallons.	Galls	Galls.	Feet.	Pounds.	Pounds.	Gal	Lbs
January...																			
February..	9.3	11.51	103.55	113,203	18.15	6,600	27,300	2,700	36,600	6,068	16.58	29,118,019	577.0	965.49	165 33	83,831,537	100,489,144	4	8
March.....	23	11.52	255.00	280,021	18.30	18,400	62,900	6,900	88,200	14,260	16 16	52,256,566	592.5	978.87	165.21	84,991,347	101,382,699	7	10
April......	21	10.32	229.10	241,776	17.58	13,900	54,400	4,300	72,600	11,420	15 73	45,103,313	621.2	1,032.25	166.17	91,156,725	108,929,284	6	9
May.......	23	10.52	250 05	267,850	17.85	14,800	60,850	6,400	82,050	12,800	15.60	49,967,417	608 9	1,005.66	165.21	87,359,612	103,506,948	6	10
June.......	15	12.24	185 55	192,655	17.27	9,400	45,900	4,300	59,600	6,252	10.48	35,939,788	603 0	995.67	165 02	86,402,708	96,526,672	4	8
July	9	13.00	117.00	130.165	18.54	5,000	31,650	2,400	39,050	3,905	9.98	24,282,280	621.5	1,025.60	165.02	89,007,705	98,977,736	2½	5
August....	9	11.41	105 10	118,150	18.72	4,900	21,550	2,700	32,150	2,835	8.82	22,040,880	682 3	1,129.90	164 44	97,264,585	107,353,113	3	6
September.	25	11.50	295 40	330,610	18.63	15,600	66,550	7,500	89,650	10,050	11.21	61,675,295	687 9	1,135.03	164.80	98,435,252	110,863,321	8	12
October....	18	11.49	212 55	237,709	18.60	11,100	48,450	5,400	64,950	7,452	11.47	44,344,608	682 7	1,123.85	164.56	97,585,356	110,196,711	5	9
November.	18	11 30	206 45	229,171	18.47	11,200	46,350	5,400	62,950	7,917	12.58	42,751,847	679.1	1,117.53	164.56	97,037,516	110,956,928	5	8
December.	23	11.00	253.00	271,400	17.88	15,200	53,300	6,600	77,100	9,500	12.32	50,629,669	656.6	1,079.71	164.44	93,891,576	106,790,540	8	15
Totals and Averages.	193.8	11.27	2,214.55	2,412,710	18.16	126,100	524,200	54,600	704,900	92,459	18.12	458,109,682	649.9	1,072.20	164.98	91,467,668	105,448,532	58½	100

COST OF PUMPING WITH THE LEAVITT ENGINE.

259,150 pounds of coal, at $5.40 per net ton		$699 70
20,300 pounds of coal, at $5.48 per net ton		55 62
425,450 pounds of coal, at $4.50 per net ton		955 26
15,000 pounds of coal, at $5.40, for heating		24 30
7 cords of wood, at $4.50		31 50
Oil, waste, packing, etc.		131 01
Repairs, ordinary, on engine, boilers and furnaces		308 23
Wages of engineer and firemen		1,569 06
Total		$3,774 68
Cost of raising one million gallons into the reservoir	$8 23.97	
Cost of raising one million gallons one foot high	0 04.99	

TABLE II.

Record of the Deane Engine for the year ending December 31, 1884.

Date.	No. of pumping days.	Average pumping time per day.	Total pumping time per month.	Total number of revolutions per month.	Average revolutions per minute.	Coal Consumed.				Ashes and cinders.	Ashes and cinders.	No. of gallons pumped per month, allowing 4 per cent. for loss of action in the pump.	Average number of gallons pumped per pound of coal.	Average number of gallons raised 100 feet high per pound of coal.	Average head against the pump.	Average duty in lbs. of water, raised one foot high per 100 pounds of coal. Calculated on total coal consumed — no deduction for ashes.	Average duty calculated on total coal consumed, the ashes and cinders being deducted.	Oil.	Waste.
						Raising steam.	Pumping.	Banking.	Total.										
Month.	Days.	H. M.	H. M.	Rev.	Rev.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Per ct	Gallons.	Galls	Galls.	Feet.	Pounds.	Pounds.	Gal	Lbs
January...	27	15.46	423.45	565,554	22.25	12,400	128,200	5,100	145,700	20,670	14.12	53,162,076	364.8	559.86	153 47	48,922,816	55,893,661	12	25
February..	12.7	13.50	171.45	230,630	22.38	5,900	51,600	2,400	59,900	9,932	16.58	21,563,905	359.9	541.47	152.45	47,069,983	57,032,043	6	10
March.....																			
April......																			
May																			
June.......	10	13.15	132.30	177,536	22.38	6,100	37,600	3,000	46,700	4,898	10.48	16,688,384	355.2	545.62	153 61	47,664,706	53,249,648	4	10
July	17	18.12	309.30	408,892	22.02	9,900	86,000	4,800	100,700	6,252	9.98	38,436,036	381.6	583.27	152.85	50,491,696	56,090,744	4	8
August....	18	17.19	311.45	415,018	22.19	11,100	84,900	5,100	101,100	8,915	8.82	39,011,692	386.4	589.10	152 46	51,110,500	56,054,387	5	9
September.																			
October....	7	12.04	84 25	111,742	22.06	4,300	24,350	2,100	30,750	3,528	11.47	10,503,748	341.5	520.65	152.46	44,562,409	50,337,745	2	8
November.	5	11.59	59.55	80,280	22.30	2,100	17,100	1,500	20,700	2,603	12.57	7,546,320	364.5	555.71	152.46	47,559,181	54,405,429	1	2
December.																			
Totals and Averages.	96.7	15.27	1,493.55	1,989,652	22.20	51,800	429,750	24,000	505,550	56,798	11.23	186,912,161	369.7	564.97	152.82	48,376,635	54,499,608	34	67

COST OF PUMPING WITH THE DEANE ENGINE.

299,950 pounds of coal, at $4.50 per net ton		$674 88
198,100 pounds of coal, at $5.40 per net ton		534 87
7,500 pounds of coal, at $5.48 per net ton		20 55
4,642 pounds of coal, at $5.40, for heating		10 54
4 cords of wood, at $4.50		18 00
Oil, waste, packing, etc.		184 36
Repairs on engine, boilers and furnaces		146 87
Wages of engineer and firemen		1,067 92
Total		$2,657 99
Cost of pumping one million gallons into the reservoir	$14 16.70	
Cost of pumping one million gallons one foot high	0 09.27	

TABLE III.

SHOWING THE CONSUMPTION OF WATER FOR THE YEAR ENDING DECEMBER 31, 1884.

	Monthly consumption.	Average consumption per day.	Average increase per day.	Average decrease per day.	Average to each consumer.	Average to each inhabitant.
Month.	Gallons.	Gallons.	Gallons.	Gallons.	Galls.	Galls.
January.....	51,373,849	1,657,221	154,526		42.6	35.6
February....	45,484,344	1,568,426		88,795	40.3	33.7
March	49,314,508	1,590,790	22,264		40.9	34.2
April	46,456,899	1,548,563		42,227	39.8	33.3
May	48,354,073	1,559,809	11,246		40.1	33.5
June.........	55,321,995	1,844,066	284,257		47.4	39.7
July	61,436,830	1,981,833	137,767		50.9	42.6
August	61,503,767	1,983,992	2,159		50.9	42.7
September ..	62,378,583	2,079,286	95,294		53.4	44.7
October.....	55,483,366	1,789,786		289,500	46.0	38.5
November ..	48,379,760	1,612,659		177,127	41.4	34.7
December. .	51,016,408	1,645,691	33,032		42.3	35.4
To. and Av..	636,504,382	1,739,083			44.7	37.4

TABLE IV.

SHOWING THE AMOUNT OF RAINFALL ON THE WATER-SHEDS OF BOTH PONDS, LESS THE POND SURFACES, AMOUNT OF WATER DRAWN FROM THE PONDS, AMOUNT WASTED FROM THE PONDS, AMOUNT RECEIVED INTO THE PONDS, AND PER CENTAGE OF RAINFALL AVAILABLE FOR USE, FROM 1874 TO 1884, BOTH INCLUSIVE.

Date.	Rainfall.	Amount of rainfall on the water-shed of the ponds.	Amount of water drawn from the ponds for consumption.	Amount of water wasted from the ponds during the year.	Total amount consumed and wasted during the year.	Increase in the ponds during the year.	Decrease in the ponds during the year.	Total amount of the rainfall received into the ponds.	Daily average.	Per centage of the rainfall received into the ponds.
Year.	Inches.	Gallons.	Gallons.	Gallons.	Gallons.	Gallons.	Gallons.	Gallons.	Gallons.	Per c't.
1874	34.917	837,154,949	485,189.801	21 200,000	506,389,801		47,545,394	458,884,407	1.257,108	54.81
1875	41.847	1,003,305,644	471,387,757	11.609.267	482,997,024	60,281.293		543,278,317	1,488,483	54.24
1876	45.050	1,080,099,392	395,084,629	20.500.000	415.584,629	74,452,111		490,036.740	1.342,566	45.37
1877	45.650	1,094,484,734	402.161.193	131.277.511	533.438.704	60,846,704		594,285.408	1.628,179	54.29
1878	57.360	1,379,911,034	417,678.296	205.081,247	622,759 543	64,712,199		687,471.742	1,883,484	49.82
1879	41.040	983.957,360	456,319,019	164,095,022	620.414.041		203.370,014	417,044,027	1,142.586	42.38
1880	37.280	893,809,219	*401,905,570		401,905,570		49,803,426	352,102,144	964,663	39.38
1881	46.310	1,110,771,709	*439,992,684	42,355,919	482.348.603	138,262,844		620,611,447	1,700,305	55.87
1882	36.390	872,470.956	551,428.907	16.792,968	568,221,875		92,189,985	476,031,890	1.304,197	54.55
1883	30.140	722.623.655	*424,426,586	61,461,602	485,888,188		113,600,091	372.287,997	1,019,967	51.51
1884	47.750	1.144,833,429	†541,225,365	104,208,215	645,433,580	53.996,958		699,430,538	1,911,012	61.09

* Water drawn from tubular wells deducted.
† Less water drawn from tubular wells and new supply.

TABLE V.

SHOWING THE DEPTH OF WATER IN THE PONDS FOR EACH WEEK DURING THE YEAR 1884.

Date.		Breed's Pond.		Birch Pond.		Date.		Breed's Pond.		Birch Pond.		Date.		Breed's Pond.		Birch Pond.	
		Ft.	In.	Ft.	In.			Ft.	In.	Ft.	In.			Ft.	In.	Ft.	In.
Jan.	5	9	8	Drawn off.		May	3	20	7½	11	5½	Sept.	6	15	7	Drawn off.	
"	12	11	7			"	10	20	8	11	4	"	13	14	11½		
"	19	12	4			"	17	20	10½	10	11	"	20	14	2		
"	26	12	11			"	24	20	8	11	3½	"	27	13	8		
Feb.	2	13	2½			"	31	20	8½	11	2½	Oct.	4	13	1		
"	9	13	11			June	7	20	8½	10	10	"	11	12	8		
"	16	15	1½			"	14	20	8½	10	4	"	18	12	2		
"	23	16	8			"	21	20	7½	9	9	"	25	11	9		
Mch.	1	17	11			"	28	20	9½	9	3	Nov.	1	11	8		
"	8	18	1			July	5	20	7	8	9	"	8	11	4½		
"	15	18	7	5	9½	"	12	20	2½	8	5	"	15	10	10		
"	22	19	9	7	5½	"	19	20		7	10	"	22	10	5½		
"	29	20	10½	8	9	"	26	19	5½	7	5½	"	29	10	4	3	9
Apr.	5	20	9½	9	8	Aug.	2	18	10	7	6	Dec.	6	9	11	4	5
"	12	20	11	10	6	"	9	18	5½	7	4	"	13	9	11½	5	6
"	19	21	0½	11	1	"	16	17	10	5	0	"	20	10	6	6	4
"	26	20	10½	11	4½	"	23	17	1	Drawn off.		"	27	11	2	7	1
						"	30	16	5½			"	31	11	6½	7	4½

FOR THE LAST 11 YEARS.

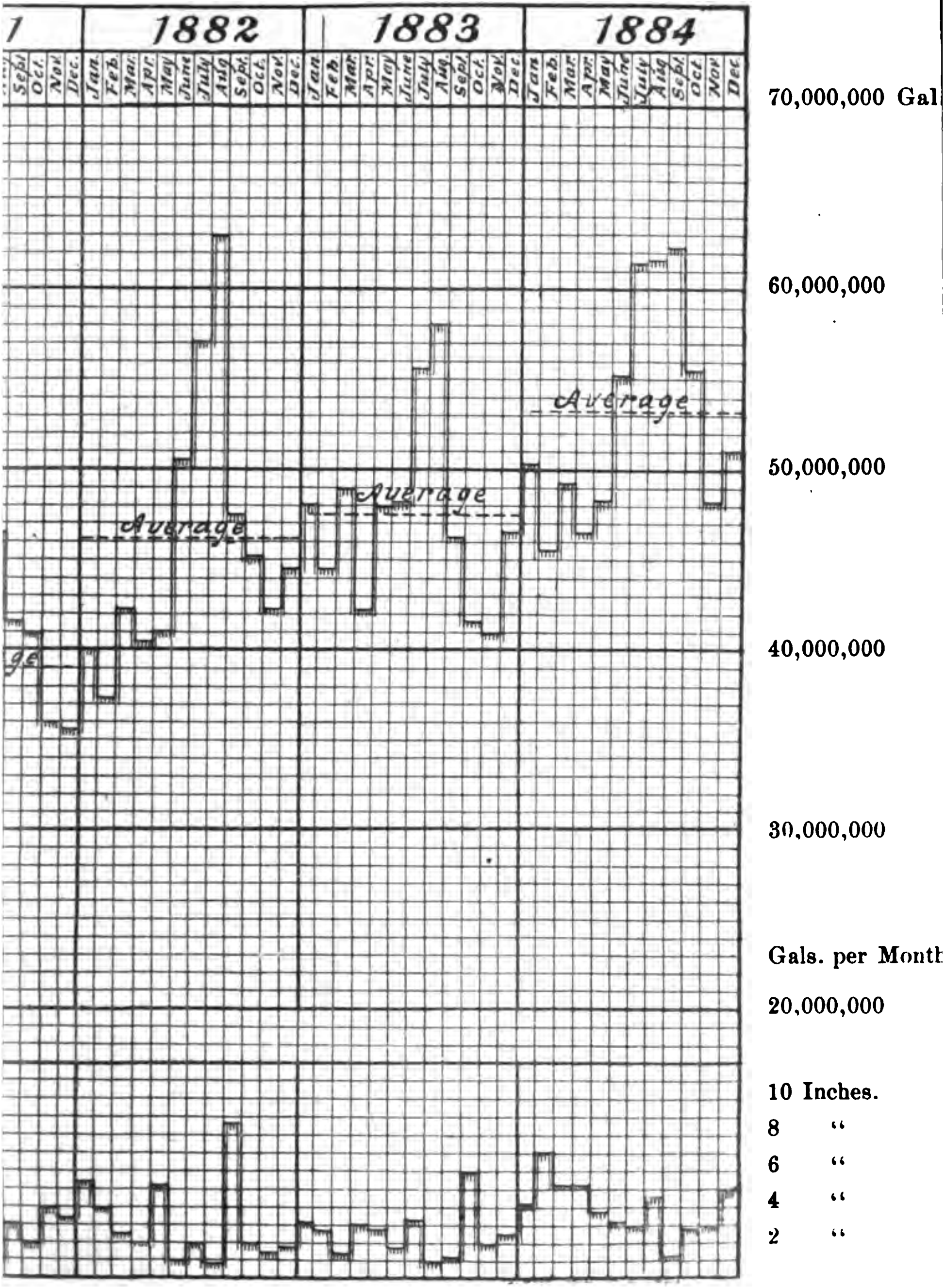
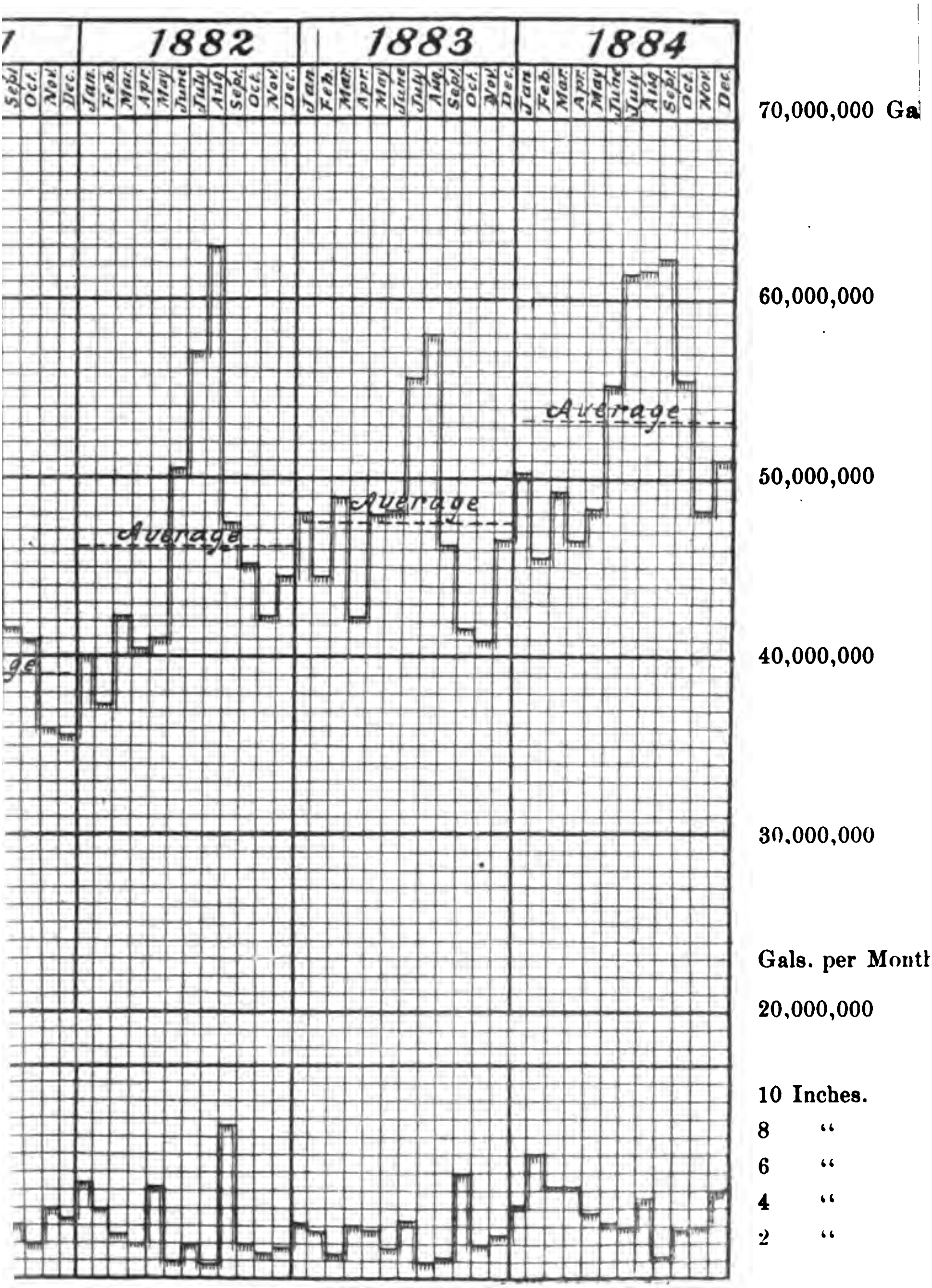


TABLE V.

SHOWING THE DEPTH OF WATER IN THE PONDS FOR EACH WEEK DURING THE YEAR 1884.

Date.	Breed's Pond.		Birch Pond.		Date.	Breed's Pond.		Birch Pond.		Date.	Breed's Pond.		Birch Pond.	
	Ft.	In.	Ft.	In.		Ft.	In.	Ft.	In.		Ft.	In.	Ft.	In.
Jan. 5	9	8	Drawn off.		May 3	20	7½	11	5½	Sept. 6	15	7	Drawn off.	
“ 12	11	7			“ 10	20	8	11	4	“ 13	14	11½		
“ 19	12	4			“ 17	20	10½	10	11	“ 20	14	2		
“ 26	12	11			“ 24	20	8	11	3½	“ 27	13	8		
Feb. 2	13	2½			“ 31	20	8½	11	2½	Oct. 4	13	1		
“ 9	13	11			June 7	20	8½	10	10	“ 11	12	8		
“ 16	15	1½			“ 14	20	8½	10	4	“ 18	12	2		
“ 23	16	8			“ 21	20	7½	9	9	“ 25	11	9		
Mch. 1	17	11			“ 28	20	9½	9	3	Nov. 1	11	8		
“ 8	18	1			July 5	20	7	8	9	“ 8	11	4½		
“ 15	18	7	5	9½	“ 12	20	2½	8	5	“ 15	10	10		
“ 22	19	9	7	5½	“ 19	20		7	10	“ 22	10	5½		
“ 29	20	10½	8	9	“ 26	19	5½	7	5½	“ 29	10	4	3	9
Apr. 5	20	9½	9	8	Aug. 2	18	10	7	6	Dec. 6	9	11	4	5
“ 12	20	11	10	6	“ 9	18	5½	7	4	“ 13	9	11½	5	6
“ 19	21	0½	11	1	“ 16	17	10	5	0	“ 20	10	6	6	4
“ 26	20	10½	11	4½	“ 23	17	1	Drawn off.		“ 27	11	2	7	1
					“ 30	16	5½			“ 31	11	6½	7	4½

OR THE LAST 11 YEARS.



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ASTOR, LENOX AND
TILDEN FOUNDATIONS.

TABLE VI.

SHOWING THE RAINFALL AT THE PUMPING STATION FOR THE YEAR 1884.

Day of the Month.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
2	1.30	.....	.....	1.70	.....	.....	.....	.....	.....	.....	.....	.....
3	.....	.16	.01	.66	.....	.....	.....	.....	.....	.04	.....	.....
4	.....	.15	.....	.03	.....	.....	.85	.01	.....	.40	.37	.....
5	.....	.32	.17	.....	.08	.25	.20	.84	.....	.....	.....	.....
6	.....	.17	.....	.....	.03	.....	.....	.....	.....	.03	.....	1.30
7	.....	.03	.53	.40	.18	.05	.02	2.20	.....	.....	.....	.....
8	1.45	.04	.68	.02	.35	.....	.01	.10	.01	.16	.....	.....
9	.....	.....	.38	.52	.....	.....	.28	.....	.....	.....	.....	.....
10	.....	.....	.....	.15	.24	.....	.....	.....	.66	.....	.....	.11
11	.03	.24	.06	.05	.....	.....	.....	.05	.35	.....	.....	.15
12	.....	.15	.....	.....	.....	.39	.08	.21	.....	.10	.....	.02
13	.01	.36	.....	.....	.40	.....	.05	.08	.....	.....	.....	.10
14	.....	.....	.21	.....	.08	.....	.....	.....	.....	.....	.....	.72
15	.....	.....	.04	1.04	.01	.....	.01	.....	.....	.....	.....	.08
16	.....	.....	.....	.03	.....	.....	.....	.....	.....	.....	.....	.05
17	.....	.70	.....	.06	.....	.....	.02	.....	.....	.....	.....	.19
18	.....	.10	.....	.07	.....	.....	.....	.....	.....	.05	.07	.....
19	.22	.15	.75	.02	.....	.14	.01	.....	.....	.....	.42	.....
20	.....	.42	.76	.08	1.38	.....	.....	.....	.16	.....	.....	.04
21	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1.30
22	.....	.....	.....	.....	.....	.....	.....	.....	.....	.42	.....	.11
23	.77	1.48	.39	.....	.03	.....	.....	.....	.....	.....	.94	.04
24	.01	.....	.....	.14	.....	.....	.....	.....	.....	.....	.....	.53
25	.....	.20	.....	.16	.....	2.48	.03	.03	.....	.....	.....	.02
26	.....	.86	.76	.02	.....	.....	.....	.31	.....	.....	.....	.....
27	.....	.....	.18	.....	.....	.....	.27	.....	.07	.....	.04	.02
28	.06	1.44	.....	.....	.90	.....	.....	.....	.08	.....	.80	.....
29	.....	.....	.20	.....	.....	.....	.86	.75	.....	.23	.26	.....
30	.31	.....	.08	.....	.....	.....	.02	.....	.....	.90	.....	.....
31	.03	.....	.....	.....	.....	.....	.17	.....	.....	.45	.....	.....
	4.19	6.97	5.20	5.15	3.68	3.31	2.88	4.58	1.33	2.78	2.90	4.78

Total rainfall for the year, 47.75 inches.

TABLE VII.

SHOWING THE AMOUNT AND SIZE OF PIPE LAID IN 1884.

STREETS WHERE LAID.			SIZE OF PIPE.				
Street.	From	To.	30	18	10	6	4
			ft.	ft.	ft.	ft. in.	ft. in.
Adams.........	Sheridan....	Highland Ave..			c'm't	824.0	
Allen Ave......	End of pipe.	Bay View Ave..			W.I.	181 0	
					c'm't	569.0	
Ashland	Summer				C. I.	36.0	
					c'm't	325.6	
Barrett's Ct....	Boston......	End of Ct......				C. I.	78.6
						c'm'nt.	315.0
Blanchard	Jackson.....	Walter...			c'm't	248.0	
Brookline Ct. ..	Timson.....	Brookline......				c'm'nt.	353.0
Caldwell.......	Morton.....					c'm'nt.	108.0
Childs..........	Extension...				c'm't	227.0	
Choate.........	Oakwood Av	Silsbee Ave. ...				c'm'nt.	369.0
Clifton Ave. ...	Jackson.....					c'm'nt.	253.6
Columbia Ave. .	Extension...				c'm't	838.0	
Eastern Ave....	Extension...				C. I.	98.6	
Endicott.......	Washington.	Franklin.......			c'm't	639.6	
Fay...........	Western Ave				c'm't	518.6	
Fearless Ct....	Lewis	End of Ct......				C. I.	29.0
						c'm'nt.	436.6
Jackson........	End of pipe.	End of St......			c'm't	292.0	
Jefferson.......	End of pipe.	Duke..........			W.I.	760.0	
Lexington	Chatham....				c'm't	382.0	
Lilly..........	End of pipe.	Adams.........			c'm't	23.0	
Lynnfield	Extension...				W.I.	192.0	
Newhall Ave. ..	Chatham....	Cedar Hill Ave.			c'm't	502.0	
Otis...........	Pendexter...					c'm'nt.	188.0
Pine Grove Ave.	End of pipe.	Linwood.......			c'm't	784.0	
Phillips Ave....	Lewis	End of St......				C. I.	29.0
						c'm'nt.	542.0
Prescott Place.	Extension...					c'm'nt.	108.0
River..........	End of pipe.	Cooper			c'm't	939.6	
Rockingham ...	Extension...				c'm't	71.6	
Saratoga.......	Chatham...				C. I.	17.6	
					c'm't	600.0	
Walter.	Blanchard...				c'm't	184.0	
Western Ave...	End of pipe.	Fay...........			c'm't	416.0	
Birch Pond to connect New Supply ......C. I.			2,594				
Ocean to connect with Swampscott..........				C.	I. 58		
Pumping station, connection of Breed's and Birch Pond conduits.....................			C. I.	36			
Total			2,594	36	58	9,168.6	2,809.6

TABLE VII.—CONTINUED.

SHOWING THE LENGTH AND SIZE OF PIPE LAID IN COURTS IN 1884.

COURTS WHERE LAID.			SIZE OF PIPE.		
Court.	From.	To.	2	1½	1¼
			ft. in.	ft. in.	ft. in.
Allen Ct........	Collins		230.6		
Blaine Ave.....	Sachem.....		178.2		
Cook St........	Hollingsw'th			Galv.	133.0
Lamper's wharf	Pleasant....	Galv.	517.0		
Locust Place...	Chestnut....	Eud of Court...	288.0		
Phillips Place..	Lewis	" " "		129.7	54.10
Ridgeway Ct. ..	Ridgeway St.	" " "			120.0
River St. Ct....	Cooper	" " "			157.3
Rogers Place...	Rogers Ave..	" " "		134.0	
Sherman Ave...	Tudor	" " "	178.3		
Ward Place....	Chatham....	" " "	166.3		
Walden Place..	Summer	" " "		152.6	
Wheeler St.....	Church	" " "		139.1	
Total.......			1,270.2	555.2	465.1

	Miles.	Feet.
Total extension in 1884	3	1,404
Previously laid..	69	4,691
Total to January 1, 1885	73	815
Total in Saugus..	1	530
Total in Swampscott		1,778
Total in connection with the works....................	74	3,128

TABLE VIII.

GATES SET IN STREETS IN 1884.

Street.	Location.	Size.
Allen Ave.......	13¼ ft. N. from the S. line of Allen ave. 2½ ft. W. from the W. line of Bay View ave.	6
Ashland.........	37½ ft. W. from the E. line of Ashland st. 2 ft. N. from the N. line of Summer st.......	6
Barrett's Ct......	16 ft. E. from the W. line of Barrett's ct. 11 ft. N. from the S. line of Boston st.......	4
Blanchard.......	15 ft. S. from the N. line of Blanchard st. On the line of the E. line of Jackson st.	6
Brookline Ct.....	11¼ ft. E. from the W. line of Brookline ct. 1 ft. N. from the N. line of Brookline st.....	4
Brookline Ct.....	22¾ ft. W. from the E. line of Brookline ct. 1 ft. S. from the S. line of Timson st.	4
Caldwell	13 ft. E. from the W. line of Caldwell st. 1¼ ft. S. from the S. line of Norton st.	4
Choate	15 ft. W. from the E. line of Choate st. 1 ft. N. from the N. line of Oakwood ave....	4
Clifton Ave......	9½ ft. N. from the S. line of Clifton ave. On the line of the W. line of Jackson st.....	4
Eastern Ave.*...	15 ft. W. from the E. line of Eastern ave. 1 ft. N. from the N. line of Essex st.........	6
Endicott	16 ft. S. from the N. line of Endicott st. On the line of the W. line of Washington st.	6
Endicott.........	16 ft. S. from the N. line of Endicott st. 1 ft. E. from the E. line of Franklin st......	6
Essex*	18½ ft. N. from the S. line of Essex st. 15½ ft. E. from the W. line of Coburn st.....	6
Essex Ct.*.......	8 ft. E. from the W. line of Essex ct. ½ ft. N. from the N. line of Essex st.........	4
Fay	17½ ft. W. from the E. line of Fay st. 1 ft. S. from the S. line of Western ave......	6
Fearless Ct.	20¼ ft. E. from the W. line of Fearless ct. 1½ ft. N. from the N. line of Lewis st.	4
Lexington.......	14 ft. N. from the S. line of Lexington st. 3 ft. E. from the E. line of Chatham st.	6
Lily.......	27 ft. W. from the E. line of Lily st. 1½ ft. S. from the S. line of Adams st........	6
Newhall Ave.....	15½ ft. N. from the S. line of Newahll ave. On the line of the E. line of Chatham st.....	6
Newhall Ave.....	16½ ft. N. from the S. line of Newhall ave. On the line of the W. line of Cedar Hill ave.	6
Ocean....... ...	21 ft. N. from the S. line of Ocean st. 51 ft. W. from the W. line of Ocean Cottage.	10
Otis.............	14 ft. S. from the N. line of Otis st. 2 ft. W. from the W. line of Pendexter st....	4
Phillips Ave.	13 ft. W. from the E. line of Phillips ave. On the line of the N. line of Lewis st.	4
Rogers Ave.*....	17 ft. N. from the S. line of Rogers ave. 10 ft. W. from the W. line of High Rock ave.	6
Saratoga	30½ ft. N. from the S. line of Saratoga st. 1 ft. E. from the E. line of Chatham st.	6

*Gates set on pipes previously laid.

TABLE VIII.—CONTINUED.

GATES SET IN COURTS IN 1884.

Court.	Location.	Size.
Allen Ct.	8 ft. E. from the W. line of Allen ct. On the line of the S. line of Collins st.	2
Blaine Ave.	7½ ft. E. from the W. line of Blaine ave. 1 ft. S. from the S. line of Sachem st.	2
Cook St.	17¾ ft. W. from the E. line of Cook st. On the line of the N. line of Hollingsworth st.	1¼
Lamper's Wharf.	9¼ ft. E. from the E. line of Lamper's office. 15 ft. S. from the S. line of Lamper's office.	2
Locust Place.	3 ft. N. from the S. line of Locust pl. On the line of the E. line of Chestnut st.	2
Phillips Place.	7 ft. W. from the E. line of Phillips pl. On the line of the S. line of Lewis st.	1½
Preston Place.	34½ ft. from the E. line of the Savings Bank. 1½ feet N. from the N. line of Broad st.	2
Ridgeway Ct.	15 ft. S. from the N. line of Ridgeway ct. On line of the E. line of Ridgeway st.	1¼
River St. Ct.	5 ft. N. from the S. line of River st. ct. On the line of the W. line of Cooper st.	1¼
Rogers Place	4½ ft. W. from the man-hole to sewer. 7 ft. S. from the man-hole to sewer.	1½
Sherman Ave.	10 ft. W. from the E. line of Sherman ave. On the line of the N. line of Tudor st.	2
Walden Place.	7½ ft. E. from the W. line of Walden pl. On the line of the S. line of Summer st.	1½
Ward Place.	7 ft. S. from the N. line of Ward pl. On the line of the E. line of Chatham st.	2
Wheeler St.	16½ ft. S. from the N. line of Wheeler st. 1 ft. W. from the W. line of Church St.	1½

CONNECTION BETWEEN BREED'S AND BIRCH PONDS.

	Location.	Size.
Pumping Station.	12½ ft. W. from the W. line of building. 15 ft. S. from the S. line of Boston st.	18

Total Gates set in 1884	40
Total Gates set previously	548
Total Gates set to Dec. 31, 1884	588

TABLE IX.

SHOWING THE NUMBER AND LOCATION OF HYDRANTS SET IN 1884.

Street.	Location.
Adams	120 feet W. from Lily Street
Allen Avenue	60 feet W. from Bay View Avenue
Allen Avenue	526 feet W. from Bay View Avenue
Barrett's Court	345 feet S. from Boston Street
Columbia Avenue	50 feet E. from Eastern Avenue
Endicott	300 feet W. from Washington Street
Fay	435 feet S. from Western Avenue
Fearless Court	430 feet N. from Lewis Street
Jefferson	4 feet W. from Sheridan Street
Newhall Avenue	220 feet E. from Chatham Street
Pine Grove Avenue	240 feet E. from Linwood Street
Phillips Avenue	410 feet N. from Lewis Street
River	8 feet E. from Cooper Street
River	451 feet E. from Cooper Street
Saratoga	330 feet E. from Chatham Street
Walter	14 feet N. from Blanchard Street
Western Avenue	10 ft. W. from Fay Street

Number of Hydrants set in 1884	17
Hydrant at Lily Street, corner of Adams, discontinued	1
	16
Hydrants previously set	527
Number of Hydrants set to Dec. 31, 1884	543

TABLE X.

SHOWING THE NUMBER, SIZE AND LENGTH OF SERVICES PUT IN IN 1884.

Month.	Size and Length of Pipe.										Total.	
	2-inch.		1½ inch.		1¼ inch.		1-inch.		¾ inch.			
	No.	Length. Ft. In.	No.	Length. Ft. In.	No.	Length. Ft. In.	No.	Length. Ft. In.	No.	Length. Ft. In.	No.	Length. Ft. In.
January												
February							1	24.4			1	24.4
March												
April					2	411.8	6	248.2	34	1,242.10	42	1,902.8
May	1	40.6	1	51.4	1	211.1	5	472.8	46	1,684.2	54	2,459.9
June	5	224.2					7	359.2	44	1,818.2	56	2,401.6
July	1	88.6	1	76.0			3	405.9	55	2,042.4	60	2,612.7
August	1	517.2			1	63.7	8	453.10	58	2,232.8	68	3,267.3
September	1	16.11			1	118.7	9	909.9	36	1,295.10	47	2,341.1
October			1	103.0	2	87.3	20	1,364.5	58	2,129.0	81	3,683.8
November							9	698.8	43	1,672.0	52	2,370.8
December							7	488.2	48	1,817.0	55	2,305.2
Totals	9	887.3	3	230.4	7	892.2	75	5,424.11	422	15,934.0	516	23,368.8

TABLE XI.

REPAIRS OF PIPES, GATES AND HYDRANTS IN 1884.

Month.	Size of Pipes.											Size of Gates.						Hydrants.
	16	12	10	8	6	4	2	1½	1¼	1	¾	16	12	10	8	6	4	
January					2	2			1		2							2
February					3					1								
March				1	2					1	1							1
April			1		2	1					2							
May	2			1	2	6				1	2							
June				1	2	1					3							
July					4	5					1							
August				3	2	4												
September			1	2	3	3												
October		1	1	1	7	3	1			1	1							2
November	1		1		3	3												1
December					4	3		1			1							11
Totals	3	1	4	9	36	31	1	1	1	4	13							17

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THE NE
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TILDEN FOUNDATIONS

FOURTEENTH ANNUAL REPORT

OF THE

PUBLIC WATER BOARD

OF THE

CITY OF LYNN,

For the Year Ending December 31, 1885.

LYNN, MASS.:
WOODBURY S. PRENTISS.
1886.

V DLA p.b.

FOURTEENTH ANNUAL REPORT

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PUBLIC WATER BOARD

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CITY OF LYNN,

For the Year Ending December 31, 1885.

LYNN, MASS.:
WOODBURY S. PRENTISS.
1886.

OFFICERS FOR 1885.

D. H. Sweetser, *President*, For four years.	Albert A. Davis, For three years.
Thomas B. Newhall, For two years.	Amos F. Breed, For one year.

Nathan D. C. Breed,*
For five years.

Superintendent and Clerk—Daniel Walden.
Water Registrar—Frank McCullough.
Pumping Engineer—W. H. Messinger.
Foreman of Piping—Edwin Maxwell.
Foreman of Services—George Sanborn.
Inspectors—Winslow J. Rowell, Willis L. Snow, J. Frank Pool.

PUBLIC WATER BOARD FOR 1886.

D. H. Sweetser, *President*, for three years.
Thomas B. Newhall, for one year.
Albert A. Davis, for two years.
Alfred A. Mower, for four years.
David Knox, for five years.

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* Died March 1, 1885. Alfred A. Mower elected to fill the unexpired term.

ANNUAL REPORT.

OFFICE OF THE PUBLIC WATER BOARD,
January 18, 1886.

To the Honorable Mayor and the City Council of the City of Lynn:

The Public Water Board herewith present their fourteenth annual report, together with the reports of the Superintendent and Water Registrar.

These reports contain full information in regard to the condition of the works and the financial standing of the department, besides carefully prepared tables in which will be found much interesting and useful information.

FINANCIAL CONDITION.

It will be seen that, notwithstanding the material reduction in water rates the past year, and the increase in the interest account, arising from the large sums spent on the new supply, the department has paid all expense of maintenance, the interest on the water debt, and shows a surplus of $26,919.18 to be carried to the Water Loan Sinking Fund.

The reduction in water rates took effect the latter part of the year, after half of the collections had been made at the old rates, so that we can hardly expect that our next financial exhibit, after the reduced rates have been in operation for the full year, will be as favorable; yet with the natural increase in consumers, we trust that the surplus earnings will continue to be sufficient to provide for the necessary requirements of the Sinking Funds, which, by legislative enactment, must be adequate to pay the water loans in thirty years from their issue.

This result will be likely to be attained, unless we have serious competition in supplying our citizens with water, from a private corporation, which has already entered our territory, laid water mains in our streets, and diverted several thousands of dollars of water rates from this department. To what extent we shall be called upon to meet this competition depends upon the action of the legislature, which has been petitioned by the City Council to so amend the charter of the Marblehead Water Co., that it be restrained from digging up our streets without the consent of the Board of Mayor and Aldermen.

Under the authority contained in the water act, the city has constructed works for supplying our citizens with water, and to pay for the same has contracted a debt of more than $1,250,000. The interest on this debt, and the expense of maintenance, must be paid; and in addition the legislature requires that a Sinking Fund be provided for that will pay off the debt in thirty years. If the receipts from water rates are insufficient to meet these requirements, they must be met by an appropriation by the City Council. In other words, if the Marblehead Water Co. sells water in Lynn in competition with this department, our people will be obliged to put their hands in their pockets to pay for the deficiency which this competition causes. The privileges which the Marblehead Water Co. claims under its charter, to dig up our streets and to lay its pipes anywhere in our territory, would seem to be so unjust that we may confidently look to the legislature to right the injustice when it is properly presented.

COST OF THE WORKS.

Total gross cost of the works to Jan. 1, 1885 .		$1,344,719 23
Add construction account for 1885 . .		66,068 64
Total gross cost of the works to Jan. 1, 1886		$1,410,787 87
Less receipts for pipe labor, etc. . . .	$51,613 79	
Less premium on bonds sold . . .	9,750 00	
Less income in excess of interest payments and cost of maintenance*	147,403 94	
		$208,767 73
Total net cost of the works, Jan. 1, 1886 .		$1,202,020 14

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*This amount includes no appropriations to the Water Loan Sinking Fund, made by the City Council, or earnings of the fund since it was established.

STORAGE BASINS.

The order of the City Council requiring the raising of Birch Pond dam has been executed. By the raising of this dam the capacity of our storage basins has been largely increased, and Birch Pond will now hold nearly 400,000,000 gallons. As the level of Birch and Breed's Ponds, when full, are now the same, they can be treated as one basin; for by opening the gates the water will flow from one to the other. As we have previously stated, the raising of Birch Pond dam is not to supply storage for the water which flows through the tunnel from Hawkes and Penny Brooks, for with eight feet of water in Birch Pond it is at a level with the water in the canal; but it is expected that these ponds will be filled with water from their own water sheds, while the brooks are furnishing the city's consumption; and it depends upon the length of time the brooks will furnish the supply whether the ponds will be filled. If the ponds are once filled, we hope the necessity for drawing them down, as they have been, will not again exist. When we are compelled to draw the water down in the basins to a low point, and in many cases expose the bottom of the pond, it cannot be expected that the water will be satisfactory. A low stage of the water in the ponds in the warm season of the year tends to produce the vegetable and animal growths that contaminate the water. With the dam of Birch Pond raised nine feet it is hoped much of this difficulty will be avoided.

OUR NEW SUPPLY.

At the date of our last annual report, although the canal and tunnel for conducting the water from Hawkes and Penny brooks were completed, it was too early, as we then stated, to fully determine the comparative value of this method of utilizing the waters from these sources. The experience of the past year has shown that the quantity of water which the brooks can furnish is sufficient to meet all the demands of the city for many years to come, if it can be properly stored. The rainfall last year was 45.01 inches, and the quantity that could have been collected with adequate storage was 49%, giving as the yield of these sources 1,382,680,679 gallons; but with no storage, all that could be made available was the city's consumption from day to day while the brooks were running, which amounted last year to 357,430,000 gallons, about half of the city's consumption. This shows conclusively that without storage there would have been a waste of over 1,000,000,000 gallons; and this quantity was wasted, except about 50,000,000 gallons stored in Birch Pond, which last year was drawn off in order to raise the dam, and was nearly empty when the brooks commenced running, enabling us to save some water below the eight feet level; but as the conditions in regard to Birch Pond last year will not be likely to soon occur again, we can regard this saving of the 50,000,000 gallons as exceptional.

With the present consumption of water we may afford to let this large quantity run to waste; but if the city grows in the future as it has in the past, it will soon be found necessary to construct storage basins in order to save part of the water that is now wasted.

NEW STREET MAINS.

The City Council have, in some cases, contrary to the recommendation of the Board, ordered water pipes laid in streets where the income was entirely inadequate to warrant the large outlay, and where the streets were not in condition to properly lay the pipes, the streets being merely laid out on paper with no attempt having been made to construct or grade them, except to cut off the trees and bushes. In such cases much of the work of pipe laying has to be done over again whenever the streets are properly constructed and put to grade.

When applications for water pipes are referred to the Water Board, careful estimates are made of the cost and of the probable income for the use of water, and in all cases where the income is found to be five per cent. on the cost, recommendation is made that the pipes be laid, relying upon the future growth of the locality to furnish some compensation for the water supplied. This rule, if followed, would seem to be a just one for taxpayers and water takers, as well as a liberal one for the residents on the new streets desiring water. The City Council, without any apparent investigation, and without heeding the recommendations of the Water Board, have in some instances ordered that streets be piped when the income would not be 2% on the cost, and in one case an order for laying pipes was passed which would have involved an expense of several thousand dollars, where it was found that it would be impossible to carry out the order without trespassing upon private property and laying pipes through streets not named in the order, while by delaying the work until another season much of the expense might be saved by connecting with the high service to be laid in the Highlands.

These matters should be left to the Water Board. The facts are in their possession and it should be for them to determine whether the petitions of applicants for water should be granted.

We would therefore recommend that the matter of deciding where pipes should be laid be left in the hands of the Water Board, and that an order be passed by the City Council authorizing the Board to lay pipes wherever in their judgment it may be deemed for the best interest of the city.

LAND DAMAGES.

The construction of the tunnel and canal to convey the waters of Hawkes and Penny Brooks, involved the taking of twenty parcels of land belonging to eleven different owners. After more than a year had elapsed, the City Council having made no progress towards a settlement with the owners, passed an order authorizing the Water Board to settle all these claims for land and land damages. The Water Board believing it to be for the interest of all parties to settle with the claimants when it could be done at a fair price, rather than have recourse to the courts, have devoted much time to the matter and have effected a settlement with the owners of nine of the parcels of land taken, and satisfactory arrangements will probably soon be arrived at with others.

The claims of the owners of the land flowed by the raising of Birch Pond dam, seven in number, have been settled with one exception, and we think but few suits will be brought against the city on account of land claims.

HIGH SERVICE.

Constant complaints were heard last year of the lack of water supply for those residing in the higher part of the Highland district.

The increase of consumption throughout the city caused such a draught upon the pipes during parts of the day that the head was insufficient to give to the water takers in the Highlands sufficient head for hose and hydrant service, and in some cases they were put to much inconvenience for water for domestic use. To remedy this difficulty it was decided to lay a new 12-inch main direct to the Highlands from the reservoir, which will be disconnected from the other sections of the city. The pipe has been purchased, the route laid out, and work will be commenced as soon as the season permits. This will give the residents of this locality all the head they will need for some years to come ; but as this district becomes more densely populated it may be found necessary to erect a stand pipe upon the top of Pine Hill to be connected with this new main. This will furnish an additional head of about 50 feet, sufficient for the most elevated portions of the Highland district.

For the Public Water Board,

D. H. SWEETSER, *President.*

REPORT OF THE WATER REGISTRAR.

D. H. Sweetser, Esq., President Public Water Board:

SIR: In compliance with the City Ordinance, I take pleasure in presenting herewith the Report of the Water Registrar for the year ending Dec. 31, 1885:

SERVICES.

Whole number of services, Jan. 1, 1885, 6,505; new services put in during the year, 414; total number Jan. 1, 1886, 6,919. New services let on during the year, 422; services shut off during the year for non-payment, 75; services let on by payment of rates and fines, 57; services let on for other parties by change of ownership or occupancy, 16; shut off by request or for vacancy, 208; let on premises re-occupied, 144; services discontinued during the year, 6. Services put in at East Saugus during the year, 6; making the whole number Jan. 1, 1886, 69. Services put in at Swampscott during the year, 36; making the whole number Jan. 1, 1886, 51.

The ratio of increase yearly in the number of services for the past ten years is as follows:

1876 . .	6.54 per cent.	1881 . .	10.25 per cent.
1877 . .	7.60 " "	1882 . .	9.92 " "
1878 . .	6.14 " "	1883 . .	10.80 " "
1879 . .	6.04 " "	1884 . .	8.62 " "
1880 . .	8.75 " "	1885 . .	6.36 " "

RECEIPTS FOR THE YEAR 1885.

For the use of water for all purposes	$110,033 20
For wood	153 71
For rent, grass, fruit, etc.	55 86
For seal locks	5 00
For fines, shutting of and letting on	114 00
For summons	177 90
For extra pipe, labor, etc.	4,247 56
	$114,787 23

The whole amount of which, less the amount refunded to several parties, has been paid into the city treasury, and the Treasurer's receipts taken therefor.

There is due and uncollected on ordinary water rates	$1,145 81
Meter rates	3,592 69
Extra pipe account	378 59

EXPENDITURES FOR THE YEAR 1885.

MAINTENANCE.

Salaries and office expenses	$5,100 81
Repairs on services	2,894 36
Repairs on mains, hydrants and gates	2,319 60
Repairs on meters	376 10
Repairs on engine-house	112 75
Repairs on engines and boilers	227 83
Repairs and labor on tubular wells	37 78
Stable and workshop	1,559 38
Pumping, wages, coal, oil, etc.	5,388 31
Breed's Pond	37 31
Birch Pond	28 25
New Supply	932 36
Reservoir	36 70
Damages	277 07
Total Maintenance	$19,328 61

CONSTRUCTION.

Mains, hydrants and gates	$14,785 82
Services and court mains	10,368 26
Meters	645 00
Engine-house	16 25
Reservoir	99 19
Birch Pond	3 00
New Supply	4,288 24
Birch Pond dam	35,862 88
Total Construction	$66,068 64

COMPARATIVE STATEMENT OF REVENUE FOR 1885.

Amount due and uncollected January 1, 1886	$4,738 53
Amount collected for the year	110,517 67
	$115,256 20
Deduct amount due Jan. 1, 1885	5,167 09
	$110,089 11
Revenue for 1884	$114,903 86
Revenue for 1885	110,089 11
Decrease of revenue for 1885	$4,814 75

STATEMENT OF INTEREST, MAINTENANCE AND REVENUE FOR 1885.

Revenue for 1885		$110,089 11
Interest	$64,087 87	
Maintenance	19,328 61	
		83,416 48
Excess of revenue over interest and maintenance		$26,572 63

By the above statement is shown a deficiency in the receipts of 1885 as compared with the year 1884, caused by the reductions in water rates and the appropriation by the City Council for hydrant service.

The reduction on the October assessment of water rates amounted to	$9,761 45
The reduction in hydrant appropriation	2,000 00
Total	$11,761 45
Revenue for 1885	110,089 11
	$121,850 56
Revenue for 1884	114,903 86
	$6,946 70

This latter amount would have been the increase in the revenue but for the reductions above referred to.

Following will be found the usual tables exhibiting the number of dwellings, families, stores, factories, etc., supplied with water, the class of premises to which meters are attached, the number and kinds of fixtures, the yearly revenues of the department, etc., etc.

Appended, also, is a detailed statement of the cost of the New Supply.

Respectfully submitted,
FRANK McCULLOUGH,
Water Registrar.

TABLE

SHOWING THE NUMBER OF DWELLINGS, FAMILIES, STORES, FACTORIES, ETC., SUPPLIED WITH CITY WATER.

	1884	1885	Increase
Dwellings	6,041	6,505	464
Families	8,995	9,675	680
Boarding-houses	126	144	18
Hotels	12	19	7
Stores and shops	560	590	30
Offices	191	192	1
Restaurants and Saloons	124	127	3
Stables	527	532	5
Stationary engines	115	122	7
City fire engine-houses	4	4	–
School-houses	31	30	–
Churches	17	22	5
Factories		161	–
Public halls and buildings	20	20	–
Printing offices	9	9	–
Greenhouses	33	33	–
Bakeries	9	9	–
Barber shops	21	23	2
Planing mills	4	5	1
Machine and blacksmith shops	14	15	1
Markets	8	8	–
Banks	6	6	–
Photographers	8	8	–
Public and drinking fountains	8	9	1
Motors	10	10	-
Laundries	7	5	–
Reservoir	4	4	–
Foundry	1	1	–
Private fountains	17	18	1
Gas works	2	2	–
Steam heating works	1	1	–
Old Ladies' Home	1	1	–
City Hall	1	1	–
City Hospital	1	1	–
Almshouse	1	1	–
Children's Home	1	1	–
Post Office	1	1	–
Hand-hose	1,587	1,858	271
Railroads	3	3	–
Fire hydrants	543	557	14

STATEMENT

SHOWING THE CLASS OF PREMISES TO WHICH METERS ARE ATTACHED.

CLASS.	SIZES.								Total
	½	⅝	¾	1	1¼	1½	2	3	
Bath-rooms	–	1	–	–	–	–	–	–	1
Brewery	–	–	1	–	–	–	–	–	1
Brick-yards	–	–	–	2	–	–	–	–	2
City stable	–	–	–	1	–	–	–	–	1
Dwellings	–	1	–	–	–	–	–	–	1
Elevators	–	–	–	–	–	–	1	–	1
Engines	–	3	9	18	3	4	–	–	37
Factories	3	15	40	33	2	–	–	–	93
Fire engine-houses	–	–	1	1	–	–	–	–	2
Foundries	–	–	–	1	–	–	–	–	1
Gas works	–	–	–	–	–	2	–	–	2
Halls and buildings	–	2	5	9	–	–	–	–	16
Hotels	–	1	2	1	–	1	–	–	5
Laundries	–	1	4	–	–	–	–	–	5
Livery Stables	–	5	3	–	–	–	–	–	8
Medical Laboratory	–	–	–	1	–	–	–	–	1
Printing office	–	1	–	–	–	–	–	–	1
Railroads	–	1	6	2	–	–	1	1	11
Saloons	–	–	–	1	–	–	–	–	1
Tugs and vessels	–	–	–	–	–	–	1	–	1
Churches	–	–	–	–	1	–	–	–	1
Motors 4	–	–	–	–	–	–	–	–	–
	3	31	71	70	6	7	3	1	192

STATEMENT

SHOWING THE NUMBER AND KIND OF FIXTURES CONTAINED WITHIN THE PREMISES OF WATER TAKERS DEC. 31, 1885, COMPARED WITH THE PREVIOUS YEAR.

KIND OF FIXTURES.	1884.	1885.	Increase.
Faucets	14,195	15,238	1,043
Bath tubs	928	1,073	145
Water closets	2,815	3,216	401
Urinals	179	197	18
Hand hose	1,587	1,858	271
Steam heaters	–	21	21

STATEMENT

SHOWING THE YEARLY REVENUE OF THE DEPARTMENT SINCE THE FIRST INTRODUCTION OF WATER INTO THE CITY IN 1871.

From October 1, 1871, to January 1, 1872	$8,989	00
From January 1, 1872, to January 1, 1873	27,568	16
From January 1, 1873, to January 1, 1874	47,992	61
From January 1, 1874, to January 1, 1875	53,545	61
From January 1, 1875, to January 1, 1876	52,553	26
From January 1, 1876, to January 1, 1877	60,867	12
From January 1, 1877, to January 1, 1878	64,002	50
From January 1, 1878, to January 1, 1879	67,570	14
From January 1, 1879, to January 1, 1880	73,949	80
From January 1, 1880, to January 1, 1881	79,635	12
From January 1, 1881, to January 1, 1882	80,967	76
From January 1, 1882, to January 1, 1883	94,419	52
From January 1, 1883, to January 1, 1884	98,893	54
From January 1, 1884, to January 1, 1885	114,903	86
From January 1, 1885, to January 1, 1886	110,089	11
Total	$1,035,947	11

DETAILED STATEMENT SHOWING COST OF WORKS TO JAN. 1, 1886.

Breed's Pond and land	$37,814 51	
Birch Pond and land	81,736 20	
Pipe conduit and right of way	43,785 98	
Reservoir and land	131,581 49	
Force main and land	24,614 00	
Engine-house and land	56,493 13	
Engines and boilers	71,998 00	
Mains, hydrants and gates	579,925 96	
Services and court mains	167,429 93	
Meters	7,609 83	
Workshop and stable	1,785 99	
Engineering	8,564 99	
Tubular wells	7,317 79	
New supply	123,465 82	
		$1,344,123 62
Less amount received for extra pipe, labor, etc.		51,613 79
Total net cost to date		$1,292,509 83

CONSTRUCTION NEW SUPPLY.

Engineering	$5,432 24	
Tunnel	38,075 21	
Canal	27,221 12	
Pipe through Birch Pond	43,116 46	
Gate houses and gates	4,580 28	
Screen chamber and house	1,101 10	
Land and damages to Jan. 1, 1886	3,939 41	
Total		$123,465 82

REPORT OF THE SUPERINTENDENT.

D. H. Sweetser, Esq., President of the Public Water Board:

SIR :—In compliance with the city ordinance I respectfully submit, herewith, the annual report of the Superintendent for the year 1885 :

NEW SUPPLY.

At the beginning of the year all the water for the supply of the city was taken from the New Supply, but during the latter part of January, the most of February and the early part of March the supply was insufficient for the daily consumption of the city, and the deficiency was made up by drawing from Breed's Pond. The difficulty of obtaining a full supply from that source during the winter arises from the fact that in very cold weather all the small streams are frozen up and only a partial supply reaches the Canal while the frost continues. As the spring approached and thaws commenced, there was a large surplus of water which could not be utilized, the brooks at times running at the rate of ten or twelve millions of gallons in twenty-four hours; all that could be saved of this large flow was an amount sufficient for the daily consumption of the city, and the rest flowed to Saugus River. From the 7th of March to the 8th of June the Canal furnished the full supply to the city ; soon after that the supply was so small that its further use was abandoned for the summer. The early and abundant fall rains enabled us to commence its use again the first of November — six weeks earlier than last year, and most of the water used by the city since that time has been furnished from the New Supply. The total amount used direct from the Canal during the year has been 357,430,001 gallons, in addition to which about 52,000,000 gallons have been stored in Birch Pond, that came from that source. During the summer the Canal has been cleaned out, and all necessary repairs made to the embankments, flumes and overflows, and the Tunnel has been examined and found to be in good condition. The gates at the upper gate-house were found to leak badly, and the two most important ones have been taken out and replaced with cast iron, which, up to the present time, are tight and answer all the requirements.

PONDS.

As soon as the season would permit, work was commenced upon raising the dam at Birch Pond. Under the supervision of George H. Bishop, civil engineer, the work has been carried to a successful completion, with all the dispatch the nature of the work would allow; and it has been done in a substantial and thorough manner. The necessity of utilizing all the water in the pond for the use of the city it was possible to do before drawing the water off, delayed the puddling, somewhat, of that portion of the dam parallel to the road, but the mild weather of the fall has enabled the dam to be finished and loamed, with the exception of setting a part of the curb-stones, which could not be procured in season, and some blasting in the ledge for the waste-way.

The dam has been raised to a level with the dam at Breed's Pond (about nine feet), and the pond when full will have a depth of 21 feet 9 inches at the dam, and a capacity of about 389,000,000 gallons. Raising the dam to its present height made it necessary to raise the road at the upper end of the pond from one to seven feet, for a distance of nearly half a mile, requiring a large amount of material and labor. This was all done and the road properly fenced, without materially discommoding the public travel.

The twenty-four-inch pipe through the dam, which has been used as a waste-pipe, had to be extended thirty-six feet, on account of the necessary widening of the base of the dam. This was afterward extended 206 feet to the culvert at the road, by using the thirty-inch pipe on hand, left from the pipe laid through Birch Pond, by doing which the unsightly piece of swamp between the base of the dam and the road can be filled and graded, and the pipe left ready to be extended to the Pumping Station whenever the necessities of the city shall require a second conduit.

In the spring the outside slope of the dam will require to be sown with grass seed, and a fence erected to preserve the slopes from being destroyed by cattle; also some grading done between the dam and the road, the balance of the curbing set and the waste-way finished.

The middle of August we commenced to draw the water from the pond, in order to put in the foundation for the enlargement of the gate chamber and the necessary puddle in the dam. On the first of October the gates were closed and the filling of the pond again commenced.

Breed's Pond is in good condition; it has not required much expenditure this year and probably will not for several years to come.

Owing to the abundant fall rains the ponds have filled rapidly, and now contain more water than ever before at this season of the year, giving promise of a full and abundant supply for the coming year. Breed's Pond now contains seventeen feet ten inches, and Birch Pond eleven feet eleven inches

The water from all our sources during the past year has been of excellent quality and great purity, as may be seen from the following analysis made by Chase Palmer, Ph. D., Chemist in the State Normal School at Salem:

PARTS PER 100,000.

DATE. 1885.	SOURCE.	TOTAL SOLIDS.	FREE AMMONIA.	ALB'MINOID AMMONIA.	HARDNESS.
April 9.	Breed's Pond . . .	5.9	0.0052	0.024	not tak'n.
"	Birch Pond. . . .	5.2	0.0140	0.026	"
"	Canal (Hawkes Br'k)	5.0	0.0050	0.020	"
May 30.	Breed's Pond . . .	5.0	0.0052	0.021	0.25
"	Birch Pond. . . .	5.2	0.0080	0.023	0.28
"	Canal	5.7	0.0080	0.026	0.56
Sept. 17.	Breed's Pond . . .	4.3	Trace.	0.0185	0.6

For the analysis made May 30, Mr. Palmer says: "Some improvement has occurred in the pond waters since my last examination. This is due to their long storage during the spring.

Lynn is very fortunate in having a service water of excellent quality. It is commendable not only as a pure drinking water, but its softness also renders it desirable for general domestic use.

Respectfully,

CHASE PALMER.

The rainfall for the year has been 45.01 inches. The yield of the water shed draining into Breed's and Birch Ponds, exclusive of the water surface, has been 530,815,418 gallons, equal to 49.19 per cent. of the rainfall.

Assuming the same percentage for the yield from the water shed of the New Supply, the amount would have been 1,382,680,679 gallons from that source, a quantity sufficient, when fully utilized, to supply the city for many years to come.

The consumption for the year has been 700,989,445 gallons, an average of 1,920,519 gallons per day, an increase of 10.43 per cent. over the consumption of 1884.

TUBULAR WELLS.

The Tubular Wells have not been in use for the year. The boiler and pump have been cleaned and kept in order ready for use in case of necessity.

RESERVOIR.

The road and walk around the Reservoir have been cleaned as usual, and the woodwork of the gate-house, bridge and steps has been painted. The paving of the inside slope remains the same as at last report. The pipe connections, gates, etc., are in good condition.

PUMPING STATION.

The buildings have required but slight repairs during the past year, and are all in good condition. Drain pipes have been laid to take the water from the roof away from the building. The boilers are reported, by the inspector of the Hartford Insurance Co., to be in good order. The settings will require some repairs soon. Both engines are in good order; the Dean engine has not been run during the year, but is kept ready to start up at short notice. The Leavitt engine has done all the pumping for the year, and has fully sustained its previous reputation for economy of fuel. It has made 3,755,906 revolutions during the year, pumped 700,664,264 gallons into the reservoir, used 1,022,650 pounds of coal, pumped an average of 1,135.62 gallons one hundred feet high for each pound of coal consumed, and has made an average duty for the year of 98,605,737 feet pounds.

PIPES.

During the past year there has been the usual number of leaks upon cement pipes. Quite a number of them have been caused by pick holes, made in excavating for sewers and sewer connections; but the worst bursts that have taken place have generally been where the pipe has been damaged in previous years by excavations, and has been covered up without giving any notice of the injury, so that it could be repaired at the time it was done; in other cases, probably the larger portion, the fault is from carelessness in laying the pipe, either in not using a sufficient quantity of cement in covering the pipe, or injuring the cement while it is green, in backfilling the trenches. In either case the water gets access to the pipe, causing it to rust, and it is only a question of time when a burst will take place. In making connections with new streets in places where the pipe has been undisturbed it is found as perfect as when it was first laid, and in making about 7,000 service connections there has only one piece of pipe been found which had to be taken out. Since 1875 all the pipe has been laid by the department, and the work has been done by the day and more care used, and not one piece of pipe laid since that time has burst. Of course there have been joint leaks, and plugs have blown out, which is liable to occur on all pipes, but there has been no break in the pipe itself. This year nearly all the pipe that has been laid is of cast iron. There has been laid 5,823.8 feet of six-inch pipe and 2,554.4 feet of four-inch pipe in twenty-three different streets; 1,336.3 feet of smaller sizes have been laid in courts as mains. Pipes have been extended in the Cemetery to the new Soldiers' Lot and also to the top of Mt. Dearborn; 146 feet of four-inch and 1,333 feet of smaller sizes have been laid, making a total extension for the year of 10,747.5 feet, not including the pipe laid below the dam at Birch Pond. Twenty-one gates of various sizes have been set, in connection with new work, and one gate set on old pipe. Thirteen hydrants have been set on streets where new pipe is laid, and one hydrant set on a street where the pipe has been laid some years.

Four hundred and fourteen services have been put in in the city, of an aggregate length of 18,884.4 feet, making the total length of trench opened, 5 miles 3,232 feet. In trenching for pipes 1,136 feet of ledge have been excavated.

July 8, a contract was made with the town of Swampscott to furnish the inhabitants of that town with water for domestic and other purposes; since then we have put in thirty-six new services, at the expense of those ordering the same. Six new services have been put in in East Saugus upon the same terms. The number of services connected with these works in Swampscott is fifty-one, and in East Saugus there are sixty-nine.

During the year twenty-two new meters have been set, thirty-eight have been taken out, cleaned, repaired and reset, and eight have been discontinued.

Twenty-eight services have been lowered to prevent freezing; fifteen new stops and wastes and fourteen new lead connections have been put in to replace broken ones; one hundred and ninety-two corporations that had become filled up with rust have been dug up and drilled out; four hundred and forty-five iron stop-boxes have been set to replace decayed wooden ones; one hundred and nine leaks on main and service pipes have been repaired; six hydrants that were broken have been taken out and new hydrants set in their places; fifteen hydrants have been repaired; twenty-five gate boxes and three meter boxes found decayed have been replaced with new ones.

Six new drinking fountains for horses, of the constant running pipe variety have been set, and one has been changed to a new location.

October 27, 1885, an order was passed by the City Council for an independent pipe, to be laid from the Reservoir to the Highlands, for the separate supply of the Highland district. In pursuance of this order the board has contracted for the pipe, to be delivered in the early spring, and the same will be laid during the coming season. For details of the pipe laid and gates and hydrants set, the work performed by the Leavitt engine, monthly consumption, rainfall, etc., please see the annexed tables.

Respectfully submitted,

DANIEL WALDEN,

Superintendent.

TABLE II.

SHOWING THE CONSUMPTION OF WATER FOR THE YEAR ENDING DECEMBER 31, 1885.

	Water drawn from reservoir.	Average consumption per day.	Average daily increase.	Average daily decrease.	Average to each consumer.	Average to each inhabitant.
Month.	Gallons.	Gallons.	Gallons.	Gallons.	Galls.	Galls.
January . .	55,881,302	1,802.623	156,932		45.0	39.3
February . .	57,574,832	2,056,244	253,621		51.3	44.8
March . . .	60,266,103	1,944,068		112,176	48.5	42.4
April . . .	53,163,527	1,772,117		171,951	43.9	38.6
May	55.221,745	1,781,347	9,230		44.1	38.8
June	63.776,494	2,125,883	344,536		52.7	46.3
July	68,773,249	2,218,492	92,609		54.4	48.4
August . .	63,933,877	2,062,383		156,109	50.6	44.9
September .	59,374,366	1,979,145		83,238	48.6	42.6
October . .	54,565,355	1,760,173		218.972	43.2	37.9
November .	52,149.674	1,738,322		21,851	42.6	37.4
December .	56,308,921	1,816,417	78,095		44.6	39.1
Totals and Averages . . .	700,989,445	1,920,519			47.2	41.3

TABLE III.

SHOWING THE AMOUNT OF RAINFALL ON THE WATERSHED OF BOTH PONDS, EXCLUSIVE OF THE WATER SURFACES, AMOUNT OF WATER DRAWN FROM THE PONDS, AMOUNT WASTED, AMOUNT RECEIVED INTO THE PONDS, AND PERCENTAGE OF THE RAINFALL AVAILABLE FOR USE, FROM 1874 TO 1885, BOTH INCLUSIVE.

Date.	Rainfall.	Amount of rainfall on the watershed of the ponds.	Amount of water drawn from the ponds for consumption.	Amount of water wasted from the ponds.	STORAGE.		Total amount of the rainfall received into the ponds.	Daily average.	Percentage of the rainfall received into the ponds.	Amount drawn from tubular wells, and from new supply.
					Increase.	Decrease.				
Year.	Inches.	Gallons.	Gallons.	Gallons.	Gallons.	Gallons.	Gallons.	Gallons.	Per cent.	Gallons.
1874 . .	34.92	837,154,949	485,189,801	21,200.000		47,545,394	458,844,407	1,257,108	54.81	
1875 . .	41.85	1,003,305,644	471,387,757	11,609,267	60,281,293		543,278,317	1,488,433	54.24	
1876 . .	45.05	1,080,099,392	395,084,629	20,500,000	74,452,111		490,036,740	1,342,566	45.37	
1877 . .	45.65	1,094,484,734	402,161,193	131,277,511	60,846,704		594,285,408	1,628,179	54.29	
1878 . .	57.36	1,379,911,034	417,678,296	205,081,247	64,712,199		687,471,742	1,883,484	49.82	
1879 . .	41.04	983,957,360	456,319,019	164,095,022		203,370,014	417,044,027	1,142,586	42.38	
1880 . .	37.28	893,809,219	401,905,570			49,803,426	352,102,144	964,663	39.38	50,069,938 T. W.
1881 . .	46.31	1,110,771,709	439,992,684	42,355,919	138,262,844		620,611,447	1,700,305	55.87	27,093,350 T. W.
1882 . .	36.39	872,470,956	551,428,907	16,792,968		92,189,985	476,031,890	1,304,197	54.55	
1883 . .	30.14	722,623,655	424,426,586	61,461,602		113,600,091	372,288,097	1,019,967	51.51	144,233,861 T. W.
1884 . .	47.75	1,144,833,429	541,225,365	104,208,215	53,996,958		699,430,538	1,911,012	61.09	74,426,562 T. W. 20,852,455 N. S.
1885 . .	45.01	1,079,140,370	291,234,263	43,286,356	196,294,799		530,815,418	1,454,289	49.19	409,430,001 N. S.

TABLE IV.

SHOWING THE DEPTH OF WATER IN THE PONDS FOR EACH WEEK DURING THE YEAR.

Date.		Breed's Pond.		Birch Pond.		Date.		Breed's Pond.		Birch Pond.		Date.		Breed's Pond.		Birch Pond.	
		Feet.	In.	Feet.	In.			Feet.	In.	Feet.	In.			Feet.	In.	Feet.	In.
January	3	11	9	7	6½	May	2	18	11	11	10½	Sept.	5	18	8	Drawn off.	
"	10	12	6½	8	0	"	9	19	7	12	2	"	12	18	0½		
"	17	13	7	8	8	"	16	20	2	12	5	"	19	17	3½		
"	24	14	1	8	11½	"	23	20	6	12	9	"	26	16	6½		
"	31	14	1	9	1½	"	30	20	6	12	11½	October	3	16	0		
February	7	14	2½	9	2	June	6	20	8	13	2½	"	10	15	5½	3	0
"	14	14	9	9	8	"	13	20	7	13	1½	"	17	15	1½	5	4
"	21	15	2	10	0	"	20	20	4	12	6	"	24	14	7½	6	6½
"	28	15	2½	10	1	"	27	20	2½	11	7½	"	31	14	5	6	11
March	7	15	8	10	4½	July	4	20	4	11	0	Nov.	7	14	9	7	4½
"	14	16	0	10	6	"	11	20	3½	10	3½	"	14	15	2½	7	7¼
"	21	16	2½	10	8	"	18	20	2	9	6	"	21	15	4	7	10
"	28	16	0	10	7½	"	25	20	0	8	6½	"	28	16	11½	9	5
April	4	16	8½	10	11	August	1	19	11½	7	6	Dec.	5	17	10	9	10
"	11	17	4½	11	3	"	8	20	1	8	7	"	12	18	3½	10	1½
"	18	17	9½	11	4½	"	15	20	0	6	0½	"	19	18	6	10	11
"	25	18	0½	11	5	"	22	19	8½	5	3	"	26	18	3½	11	6½
						"	29	19	2	3	9	"	31	17	10	11	11

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TABLE IV.

SHOWING THE DEPTH OF WATER IN THE PONDS FOR EACH WEEK DURING THE YEAR.

Date.	Breed's Pond.		Birch Pond.		Date.	Breed's Pond.		Birch Pond.		Date.	Breed's Pond.		Birch Pond.	
	Feet.	In.	Feet.	In.		Feet.	In.	Feet.	In.		Feet.	In.	Feet.	In.
January 3	11	9	7	6½	May 2	18	11	11	10½	Sept. 5	18	8	Drawn off.	
" 10	12	6½	8	0	" 9	19	7	12	2	" 12	18	0½		
" 17	13	7	8	8	" 16	20	2	12	5	" 19	17	3½		
" 24	14	1	8	11½	" 23	20	6	12	9	" 26	16	6½		
" 31	14	1	9	1½	" 30	20	6	12	11½	October 3	16	0		
February 7	14	2½	9	2	June 6	20	8	13	2½	" 10	15	5½	3	0
" 14	14	9	9	8	" 13	20	7	13	1½	" 17	15	1½	5	4
" 21	15	2	10	0	" 20	20	4	12	6	" 24	14	7½	6	6½
" 28	15	2½	10	1	" 27	20	2½	11	7½	" 31	14	5	6	11
March 7	15	8	10	4½	July 4	20	4	11	0	Nov. 7	14	9	7	4½
" 14	16	0	10	6	" 11	20	3½	10	3½	" 14	15	2½	7	7¼
" 21	16	2½	10	8	" 18	20	2	9	6	" 21	15	4	7	10
" 28	16	0	10	7½	" 25	20	0	8	6½	" 28	16	11½	9	5
April 4	16	8½	10	11	August 1	19	11½	7	6	Dec. 5	17	10	9	10
" 11	17	4½	11	3	" 8	20	1	8	7	" 12	18	3½	10	1½
" 18	17	9½	11	4½	" 15	20	0	6	0½	" 19	18	6	10	11
" 25	18	0½	11	5	" 22	19	8½	5	3	" 26	18	3½	11	6½
					" 29	19	2	3	9	" 31	17	10	11	11

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TABLE V.

SHOWING THE RAINFALL AT THE PUMPING STATION FOR THE YEAR 1885.

Day of the Month.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1 .	.....	.22	.26	.....	.74	.....	.....	1.45	.01	.....	.08	.....
2 .	.....	.....	.....	.....	.03	.....	.....	.01	.....	.06	.40	.03
3 .	.....	.....	.....	.18	.....	.....	.08	.12	.....	1.65	.....	.....
4 .	.....	.03	.....	.72	.....	.14	.....	.88	.05	.15	.....	.10
5 .	.44	.....	.....	.03	.....	1.30	.....	.....	.04	.....	.....	.05
6 .	.80	.....	.....	.....	.....	.....	.03	.....	.....	.54	.33	.01
7 .	.....	.....	.02	.23	.....	.06	.11	.....	.....	.....	.14	.....
8 .	.....	.08	.....	.01	.53	.05	.....	.....	.67	.....	.47	.....
9 .	.....	1.44	.....	.....	.....	.....	.33	.....	.10	.....	.04	.16
10 .	.....	.07	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
11 .	.26	.....	.04	.....	.....	.....	.....	.02	.....	.....	.....	.....
12 .	.63	.....	.02	.09	.....	.....	.....	.....	.....	.....	.....	.....
13 .	.....	.....	.01	.18	.02	.....	.....	.....	.....	1.57	.....	.71
14 .	.....	.05	.....	.....	1.35	.....	.25	.....	.....	.29	.....	.14
15 .	.48	.02	.34	.....	.....	.....	.....	.....	.....	.....	.....	.....
16 .	1.28	.62	.04	.....	.....	.....	.....	.....	.....	.....	.....	.....
17 .	.07	.....	.....	.....	.....	.....	.....	.02	.....	.....	.....	.28
18 .	.....	.07	.01	.....	.56	.....	.....	.01	.....	.....	.....	.37
19 .	.....	.....	.....	.....	.....	.....	.....	.07	.....	.....	.21	.12
20 .	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
21 .	.....	.....	.....	.....	.....	.....	.....	1.02	.....	.25	.....	.....
22 .	.....	.....	.....	.....	.....	.12	.....	.....	.54	.....	.30	.....
23 .	.39	.....	.....	.....	.36	.....	.....	.16	.01	.....	.31	.....
24 .	.50	.....	.....	.....	.03	.....	.....	1.90	.....	.....	1.70	.....
25 .	.....	.....	.....	.....	.....	.....	.36	.47	.....	.....	1.10	.....
26 .	.....	.....	.....	.87	.....	.....	.....	.....	.....	.....	.28	.03
27 .	.26	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
28 .	.30	.....	.50	.84	.....	1.51	.....	.....	.....	.02	.....	.....
29 .	.....	.....	.02	.38	.....	.15	.46	.....	.....	1.24	.....	.....
30 .	.....	.....	.01	....	.18	.04	.....	1.56	.....	.43	.24	.....
31 .	.....	.....	.03	.....	.21	.....	.....	.02	.....	.....	.....	.24
	5.41	2.60	1.30	3.53	4.01	3.37	1.62	7.71	1.42	6.20	5.60	2.24

Total rainfall for the year, 45.01 inches.

TABLE VI.

SHOWING THE AMOUNT AND SIZE OF PIPE LAID IN 1885.

STREETS WHERE LAID.			KIND.	SIZE.	
Street.	From.	To.		6-inch.	4-inch.
Brownville ave.	Extension	–	Cem'nt	–	72.7
Bickford court	Essex	End of court.	Cast I'n	–	265.6
Chestnut ave.	Estes	Lander.	"	–	318.6
Collins ave.	Extension	–	"	104.0	69.0
Chippewa court.	"	–	"	–	225.0
Eastern ave.	"	–	"	111.0	–
East Highland	Rockland	End of street.	"	–	207.0
High Rock ave.	Beacon Hill av.	Henry avenue	"	335.0	–
Ireson ave	Chatham	Fayette	"	748.0	–
John.	Summer	–	"	574.0	285.0
Jeffrey	Boston	End of street	"	1,191.0	–
Linwood	Pine Grove av.	Ontario	Cem'nt	493.5	–
Lexington	Extension	–	Cast I'n	787.0	–
Nottingham	"	Grant	Cem'nt	–	136.0
Ontario	Linwood	–	" Cast I'n	407.0 135.0	–
Oakwood ave.	Extension	–	"	141.0	–
Oak	"	Walnut	"	127.3	–
Pine Grove ave.	"	Linwood	Cem'nt	119.0	–
Pine Grove Cem.	"	–	Cast I'n	–	146.0
Prescott place.	"	–	Cem'nt	–	107.0
Rockland	Chestnut	East Highland	Cast I'n	–	422.5
Saratoga	Extension	–	"	228.5	–
Walnut.	Oak	–	"	322.5	–
Totals				5,823.8	2,254.4

TABLE VI.—Continued.

PIPES LAID IN COURTS.			SIZE.			
Court.	From.	To.	2-inch.	1½ in.	1¼ in.	1 in.
Broad-street ct. .	Broad . . .	End of ct.	186.0	–	–	–
Chippewa-ct. pl.	Chippewa ct.	–	–	87.5	–	–
Harbor-st. ct. .	Extension .	End of ct.	–	–	35.5	–
Maple street . .	"	–	–	–	192.3	–
Pine Grove Cem.	"	–	871.0	139.0	123.0	200.0
Railroad ave. .	Washington	–	–	83.5	65.0	–
Ridgeway st. . .	Extension .	–	–	138.5	–	–
Silsbee-street ct.	Silsbee . .	End of ct.	–	140.0	134.0	–
Valley ave. . .	Extension .	–	–	73.0	–	–
Willow ave. . .	Chatham .	End of ct.	–	–	201.0	–
Totals . . .			1,057.0	661.5	750.8	200.0

	Miles.	Feet.
Total extension in 1885	2	187
Previously laid	73	815
Total to January 1, 1886	75	1,002
Total in Saugus	1	530
Total in Swampscott	2	4,518
	79	770

TABLE VII.

GATES SET IN STREETS IN 1885.

Street.	Location.	Size. Inches.
Bickford ct.	10½ ft. E. from the W. line of Bickford ct. On the line of the N. line of Essex st.	4
Chatham	16½ ft. E. from the W. line of Chatham st. 7 ft. N. from the N. line of Parrott st.	6
Chestnut ave.	9 ft. N. from the S. line of Chestnut ave. 1 ft. E. from the E. line Estes st.	4
High Rock ave.	17 ft. W. from the E. line of High Rock ave. 1 ft. S. from the S. line of Henry ave.	6
Ireson ave.	17 ft. S. from the N. line of Ireson ave. 1 ft. E. from the E. line of Fayette st.	6
Ireson ave.	16½ ft. S. from the N. line of Ireson ave. 1 ft. W. from the W. line of Chatham st.	6
John	21½ ft. S. from the N. line of Avon st. 1 ft. W. from the W. line of Summer st.	6
John	17½ ft. W. from the E. line of John st., at the angle On the line of the S. line of John st.	4
Jeffrey	33½ ft. E. from the W. line of Jeffrey st. 1½ ft. S. from the S. line of Boston st.	6
Linwood	22½ ft. S. from the N. line of Linwood st. 99½ ft. E. from the junction of Pine Grove ave.	6
Nottingham	15½ ft. W. from the E. line of Nottingham st. On the line of the N. line of Grant st.	4
Pine Grove ave.	22½ ft. N. from the S. line of Pine Grove ave. 67 ft. E. from the junction of Linwood st.	6
Rockland	8½ ft. S. from the N. line of Rockland st. 1 ft. W. from the W. line of Chestnut st.	4
Walnut	7 ft. from the N. line of house No 84 Walnut street 39 ft. E. from the W. line of Walnut st. 45½ ft. S. from Hydrant.	6
Broad st. ct.	10½ ft. W. from the E. line of Broad st. ct. 1½ ft. N. from the S. line of Broad st.	2
Cemetery	4½ ft. N. from the S. line of Hemlock ave. 2 ft. W. from the E. line of Birch ave.	2
Cemetery	27 ft. W. from the W. gate of Cemetery 11 ft. N. from the Wall near the Gate.	1½
Chippewa-ct. pl.	12 ft. S. from the N. line of Chippewa-ct. pl. 5½ ft. E. from the E. line of Chippewa ct.	1½
Railroad ave.	4 ft. S. from the N. line of Railroad ave. 7 ft. W. from the E. line of Washington st.	1½
Ridgeway ext.	20 ft. E. from the W. line of Ridgeway st. 14 ft. N. from the S. line of the extension.	1½
Silsbee st. ct.	8 ft. S. from the N. line of Silsbee-st.. ct. On the line of the W. line of Silsbee st.	1½
Willow ave.	7½ ft. S. from the N. line of Willow ave. On the line of the E. line of Chatham st.	1¼

Gates set in 1885	22
Gates set previously	588
Total gates set to Dec. 31, 1885	610

TABLE VIII.

LOCATION OF HYDRANTS SET IN 1885.

STREET.	LOCATION.
Arlington	65 feet south from Albany street.
Eastern avenue	400 feet north from Essex street.
Ireson avenue	345 feet east from Fayette street.
Jeffrey	400 feet south-east from Boston street.
Jeffrey	770 feet south-east from Boston street.
Jeffrey	1,150 feet south-east from Boston street.
John	400 feet west from Summer street.
John	At the end of the street.
Lexington	460 feet east from Chatham street.
Lexington	850 feet east from Chatham street.
Linwood	390 feet east from the junction of Pine Grove avenue.
Oak	15 feet east from Walnut street.
Ontario	437 feet east from the junction of Linwood street.
Rockland	360 feet west from Chestnut street.

Number of hydrants set in 1885	14
Hydrants previously set	543
Total number set to Dec. 31, 1885	557

TABLE IX.

SHOWING THE NUMBER, SIZE AND LENGTH OF SERVICES LAID IN 1885.

MONTH.	SIZE AND LENGTH OF PIPE.												Total.	
	4-inch.		2-inch.		1½-inch.		1¼-inch.		1-inch.		¾-inch.			
	No.	Feet.	No.	Feet.	No.	Feet.	No.	Feet.	No.	Feet.	No.	Feet.	No.	Feet.
January									3	128.8	5	153.2	8	282.0
March											1	17.6	1	17.6
April							1	192.3	5	213.8	19	1,655.3	25	2,061.4
May			7	216.5					6	347.0	38	1,423.6	51	1,987.1
June			1	20.7	2	176.7	1	148.2	8	577.2	43	1,510.8	55	2,433.6
July			7	112.4	2	135.3			13	640.2	28	1,027.8	50	1,915.7
August			1	4.0			2	34.7	15	857.5	26	987.8	44	1,884.0
September			6	133.9	1	14.0	1	102.5	10	417.8	35	1,256.2	53	1,915.4
October			2	24.3	1	32.6	3	304.3	14	1.152.3	32	1,231.8	52	2,745.3
November	1	28.2			3	164.3			5	888.4	27	1,196.7	36	2,277.6
December	2	41.9	1	52.0					11	520.0	25	770.8	39	1,364.7
Totals	3	70.1	25	502.8	9	522.9	8	782.0	90	5.775.0	279	11,231.6	414	18,884.4

TABLE X.

REPAIRS OF PIPES AND HYDRANTS IN 1885.

MONTH.	SIZE OF PIPE.							Hydrants.
	12	10	8	6	4	1	¾	
January	–	1	1	3	1	–	–	–
February	–	–	–	–	4	1	–	2
March	–	–	2	2	3	–	–	4
April	–	–	1	5	3	–	–	4
May	–	–	1	5	4	–	–	–
June	–	–	2	1	1	–	–	–
July	–	1	4	6	5	–	–	–
August	1	–	–	7	8	–	–	–
September	–	–	1	1	9	–	–	1
October	–	–	1	2	6	–	1	3
November	–	–	–	2	2	–	1	–
December	–	–	–	4	5	–	1	1
Totals	1	2	13	38	51	1	3	15

Meteorological Record for January, 1885.

	8 A.M.		1 P.M.		6 P.M.		24 HOURS ENDING 8 A.M.				
Date.	Barometer.	Thermometer.	Barometer.	Thermometer.	Barometer.	Thermometer.	Maximum Thermometer.	Minimum Thermometer.	Daily range.	Daily mean.	Rainfall.
1	29.82	53°	29.81	46°	29.82	38°	53°	11.5°	41.5°	32.25°	–
2	29.89	12	30.00	16	30.12	11.5	17	2	15	9.5	–
3	30.43	2.5	30.48	18	30.49	19.5	25	4	21	14.5	–
4	30.51	24	30.50	34	30.49	35	37	27	10	32	–
5	30.37	30	30.34	41.5	30.43	35	44.5	31.5	13	38	.44
6	30.21	36	30.11	51	29.85	51	55	38	17	46.5	.69
7	29.59	46	29.51	51	29.51	42	57	35.5	21.5	46.2	–
8	29.63	36	29.77	41.5	29.86	37	42	34	8	38	–
9	29.90	38.5	29.83	50	29.70	46	50	31	19	40.5	–
10	29.68	31	29.77	26.5	29.87	23	31.5	21.5	10	26.5	–
11	30.06	21	30.07	36.5	30.07	41	50	33.5	16.5	41.7	.21
12	29.91	49	29.62	57	29.66	42	58	30.5	27.5	44.2	.74
13	30.00	31	30.13	30	30.19	26	34	16	18	25	–
14	30.35	16	30.40	25.5	30.43	27	30.5	22	8.5	26.2	–
15	30.48	29	30.46	32.5	30.39	32.5	36	28	8	32	.44
16	30.25	28.5	30.24	33	30.23	34	38	29	9	33.5	1.24
17	29.97	32.5	29.88	44	29.81	29	43	16	27	29 5	.03
18	30.14	16.5	30.16	24	30.20	22.5	13.5	–	–	–	–
19	30.30	12	30.31	19	30.22	16	–	–	–	–	–
20	30.32	9	30.32	22.5	30.30	22.5	–	–	–	–	–
21	30.25	27.5	30.23	35	30.20	24.5	35	1	34	18	–
22	30.17	1	30.19	2	30.22	0	4	–1	5	1 5	–
23	30.30	1.5	30.30	22	30.30	25	28	3	25	15.5	.22
24	30.27	27	30.22	29	30.18	28	34	27.5	6.5	30.7	.45
25	30.07	36	30.03	40.5	30.00	37	41	30	11	35.5	–
26	29.93	30	29.89	32	29.85	19.5	33	8	25	20.5	–
27	29.87	9	29.97	13.5	30.04	11.5	27	7	20	17	.27
28	30.06	14	30.02	4	29.98	7	15	–2	17	6.5	.12
29	30.00	0	30.05	13	30.10	12	16	3	13	9.5	–
30	30.18	8	30.19	22	30.18	25	25	10	15	17.5	–
31	30.19	17	30.19	30	30.20	27	33.5	17.5	16	25.5	–
Monthly range									60°		
Monthly mean										21.1°	
Monthly rainfall											4.85

Meteorological Record for February, 1885.

	8 A.M.		1 P.M.		6 P.M.		24 hours ending 8 A.M.				
Date.	Barometer.	Thermometer.	Barometer.	Thermometer.	Barometer.	Thermometer.	Maximum Thermometer.	Minimum Thermometer.	Daily range.	Daily mean.	Rainfall.
1	30.16	20.5°	30.15	31.5°	30.10	24.5°	34°	6°	28°	20°	.16
2	30 02	6	30 02	5.5	30.02	5	8	3.5	4.5	5.7	–
3	30.02	3.5	30.01	12	30.01	13	20	5	15	12.5	–
4	29.99	20	29.97	27.5	29.95	25.5	25.5	20	5.5	22.7	.03
5	29.88	26	29.85	36	29.83	32.5	36.5	18	18.5	27.2	–
6	29.82	18.5	29.82	22	29.82	22	22.5	4	18.5	13.2	–
7	29.84	5	29.85	19.5	29.88	16.5	21.5	6.5	15	14	–
8	29.92	16.5	29.91	18	29.93	19.5	22.5	16	6.5	19.2	.08
9	29 99	19	30.02	28.5	30.04	31.	42.5	20	22.5	31.2	1.19
10	29.87	39.5	29.72	46	29.60	27.5	47	4	43	25.5	.04
11	29.66	4	29.71	6	29.78	4	7	2.5	4.5	4.7	–
12	29.97	3.5	30.02	14.5	30.04	18	19.5	4	15.5	11.7	–
13	30.07	15	30.08	26	30.08	22	28.5	13	15.5	20.7	–
14	30.10	13.5	30.10	21.5	30.10	23	25	13.5	11.5	19.2	.05
15	30.10	15	30.10	26.5	30.10	26	32	15	17	23.5	.02
16	30.15	32	30.13	33.5	30.05	34	39	13	26	26	.54
17	29.82	14	30.83	11	29.84	7.5	14	7.5	6.5	10.7	–
18	29.90	11.5	29.91	18	29.91	17.	20	7.5	12.5	13.7	.04
19	29.92	9	29.91	16.5	29.91	15.5	18.5	8	10.5	13.2	
20	29.91	11	29.90	20	29.89	17	21	11	10	16	
21	29.88	16	29.89	26.5	29.90	26	28.5	15.5	13	22	
22	29.96	17.5	29.96	26.5	29.97	26	29	15	14	22	
23	30.01	16	30.03	24.5	30.05	20.5	25	12.5	12.5	18.7	
24	30.11	15	30.14	28.5	30.16	30	30	16	14	23	
25	30.17	26	30.16	29	30.15	27.5	31	16	15	23.5	
26	30.16	20	30.17	33.5	30.16	31	34	21	13	27.5	
27	30.14	28	30.12	33.5	30.09	32.5	33.5	27.5	6	30.5	
28	30.09	29	30.09	37	30.09	35	40.5	31.5	9	36	
Monthly range									44.5		
Monthly mean										19.8	
Monthly rainfall											2.15

Meteorological Record for March, 1885.

	8 A.M.		1 P.M.		6 P.M.		24 HOURS ENDING 8 A.M.				
Date.	Barometer.	Thermometer.	Barometer.	Thermometer.	Barometer.	Thermometer.	Maximum Thermometer.	Minimum Thermometer.	Daily range.	Daily mean.	Rainfall.
1	30.09	33.5°	30.04	44.5°	30.00	42.5	44°	34	10°	39°	.24
2	29.84	44	29.79	43	29.79	36.5	43	25.5	17.5	34.2	–
3	29.79	27	29.83	35.5	29.86	32.5	35.5	28	7.5	31.7	–
4	29.92	34	29.92	44	29.93	43.5	47	34	13	40.5	–
5	29.97	36	29.99	43.5	29.99	37.5	44	25	19	34.5	–
6	30.05	25	30.07	35.5	30.09	34	36.5	23	13.5	29.7	–
7	30.09	23	30.09	32	30.08	27.5	32	22.5	9.5	27.2	.01
8	30.07	23.5	30.05	29.5	30.04	23	29.5	9.5	20	19.5	–
9	30.05	11.5	30.05	21.5	30.05	26	30.5	13	17.5	21.7	–
10	29.98	26.5	29.97	28	30.07	25	29	11.5	17.5	20.2	–
11	30.05	12	30.07	20.5	30.09	21.5	26	12.5	13.5	19.2	.04
12	30.09	26	30.09	30	30.10	15	30	4	26	17	.01
13	30.13	7	30.14	20.5	30.14	21	26	7	19	16.5	–
14	30.12	19	30.11	30	30.09	29.5	34	19.5	14.5	26.7	–
15	30.08	31.5	30.06	37.5	30.01	34	40	26	14	33	.32
16	29.87	26	29.87	32	29.89	31	34	12	22	23	.03
17	29.94	14	29.96	22	29.98	22	24.5	5	19.5	14.7	–
18	30.	9.5	30.01	22	30.00	19	22.5	10	12.5	16.2	.01
19	29.98	15	29.94	27.5	29.92	27.5	30.5	11.5	19	21	–
20	29.88	14	29.87	20	29.86	16.5	22	8	14	15	–
21	29.88	10.5	29.89	18	29.90	17	20.5	10	10.5	15.2	–
22	30.03	12.5	30.04	24	30.03	23.5	26.5	13.5	13	20	–
23	30.03	15.5	30.03	22.5	30.03	25	28	8	20	18	–
24	30.07	17	30.08	31	30.08	33.5	35.5	18	17.5	26.7	–
25	30.07	32	30.07	34.5	30.08	32	35.5	23	12.5	29.2	–
26	30.11	27.5	30.11	39.5	30.11	38	39	28.5	10.5	33.7	–
27	30.11	39	30.10	52	30.05	46	51	42	9	46.5	–
28	29.94	46	29.94	51.5	29.95	45	50.5	27	23.5	38.7	.32
29	29.98	26.5	30.01	28	30.03	27.5	30	20	10	25	.02
30	30.17	26	30.24	35	30.30	34	37	28.5	8.5	32.7	.01
31	30.37	37	30.34	52.5	30.27	47	52.5	39.5	13	46	.02

Monthly range 48.5
Monthly mean 26.87
Monthly rainfall 1.03

Meteorological Record for April, 1885.

	8 A.M.		1 P.M.		6 P.M.		24 hours ending 8 A.M.				
Date.	Barometer.	Thermometer.	Barometer.	Thermometer.	Barometer.	Thermometer.	Maximum Thermometer.	Minimum Thermometer.	Daily range.	Daily mean.	Rainfall.
1	30.23	45	30.22	57	30.21	50.5	57.5	32.5	25	45	–
2	30.27	34	30.29	37	30 30	36.5	49	34	15	41.5	–
3	30.17	49	30.07	63.5	29.99	56	64	34	30	49	.16
4	29.93	35	29.84	36	29.74	35.5	37.5	33.5	4	35.5	.57
5	29.72	36	29.73	46.5	29.73	46.5	49	36	13	42.5	.04
6	29.70	43.5	29.72	45.5	29.78	40	49	34	15	41.5	–
7	30.04	45	30.12	47	30.15	45.5	47	42	5	44.5	.22
8	30.10	44	29.96	57.5	29.91	60	62	27.5	34.5	44.7	.01
9	29 85	27.5	29.90	33.5	29.93	33	36	27	9	31.5	–
10	29.80	33	30.00	35 5	30.01	34	36	31	5	33.5	–
11	29.99	35	29 95	38	29.91	36	39.5	35.5	4	37.5	–
12	29.87	37	29.87	37.5	29.86	37.5	39.5	34.5	5	37	.07
13	29.84	38	29.84	44	29.84	38.5	40	35	5	37.5	.14
14	29.87	40	29.91	48	29.94	45	50	32.5	17.5	41.2	.01
15	29.99	38	29.98	51	29.95	49	51	36	15	43.5	–
16	29.94	39.5	29.94	47	29.94	46	49.5	33.5	16	41.5	–
17	29 98	41.5	30.00	53	30.02	50.5	54	36	18	45	–
18	30.10	44	30.18	44	30.25	42	47.5	36.5	11	42	–
19	30.34	47.5	30.36	47.5	30.37	48	54.5	38	16.5	46.2	–
20	30 40	54.5	30 40	67.5	30.39	59.5	68	52	16	60	–
21	30.35	64	30.31	71.5	30.27	63.5	72	53	19	62.5	–
22	30.24	64	30.26	59.5	30.26	52	66.5	46	20.5	56.2	–
23	30.29	49	30.28	65.5	30.23	60.5	69	49	20	59	–
24	30.15	55.5	30.37	74	30.01	64.5	74.5	56.5	18	65.5	.01
25	30.03	59.5	30.05	60.5	30.07	53	61.5	42.5	19	52	–
26	30.17	44	30.17	41.5	30.14	39	46	38	8	42	.77
27	30.02	46	30.00	60	29.98	60	62.5	40	22.5	51.2	–
28	30.00	47.5	29.99	48.5	29.93	46	52.5	41.5	11	47	.94
29	29 74	40 5	29.57	41.5	29.57	42	49	40.5	9	44.7	.28
30	29.68	49	29.69	64	29.67	62	67	42	25	54.5	–
Monthly range									47.5		
Monthly mean										44.37	
Monthly rainfall											3.22

Meteorological Record for May, 1885.

	8 A.M.		1 P.M.		6 P.M.		24 HOURS ENDING 8 A.M.				
Date.	Barometer.	Thermometer.	Barometer.	Thermometer.	Barometer.	Thermometer.	Maximum Thermometer.	Minimum Thermometer.	Daily range.	Daily mean.	Rainfall.
1	29.78	45°	29.81	43.5°	29.83	40°	48.5°	37°	11.5°	42.7°	.64
2	29.71	37	29.67	43	29.67	49	49	35.5	13.5	42.2	.03
3	29.75	38	29.77	45.5	29.79	46	47	32	15	39.5	–
4	29.85	40	29.90	42.5	29.93	41	49	39.5	9.5	44.2	–
5	30 02	47	30.05	46.5	30.03	46	52	44	8	48.	–
6	30.06	47	30.07	46.5	30.08	45	50	42	8	46.	–
7	30.09	44.5	30.09	48	30.08	44	48	41	7	44.5	–
8	30.06	41	30.04	43	29 98	41	44	40.5	3.5	42.2	.47
9	29.89	44	29.86	48.5	29.81	50	52.5	42	10.5	47.2	–
10	29.78	49	29.78	58.5	29.79	55	59.5	39	20.5	49.2	–
11	29.87	48	29.92	52	29.94	51.5	56	40	16	48.	–
12	30.07	48	30.10	56	30.11	55	57	44.5	12.5	50.7	–
13	30.17	53	30.18	53.5	30.19	50	57.5	43.5	14	50 5	.01
14	30.18	45	30.13	45.5	30.02	44.5	56	44.5	11.5	50.2	1.05
15	29.94	56	29.96	62	30.04	56	68	52	16	60.	–
16	30.16	57	30.25	51.5	30.28	47	57	42.5	14.5	49.7	–
17	30.29	48.5	30.27	53	30.25	52	55	41.5	13.5	48.2	–
18	30 15	52	30.07	55	29.96	50	63	49	14	56.	.55
19	29.84	63	29.88	74.5	29.87	70	74	60.5	13.5	67.2	–
20	30.09	60	30.17	54	30.18	55	60	48	12	54.	–
21	30.26	55	30.29	55.5	30.31	54	59.5	47	12.5	53.2	–
22	30.32	57.5	30.31	56.5	30.27	60	60	53	7	56.5	–
23	30.22	57.5	30.20	53.5	30.20	53.5	58	52	6	55.	.39
24	30.23	58.5	30.25	59.5	30 22	58	61	52.5	8.5	56.7	04
25	30.11	57.5	30.07	67.5	30.02	62	67.5	57	10.5	62.2	–
26	29.91	68	29.93	77	29.94	76	76.5	58	18.5	67.2	–
27	30.03	70	30.01	78	29.98	77	77.5	53	24.5	65.2	–
28	30.10	56.5	30.13	59.5	30 12	55	61	46	15	53.5	–
29	30.14	61	30 12	63	30.07	66	68.5	48	20.5	58.2	–
30	30.04	62.5	30.03	64.5	29.99	58	68	53.5	14.5	60.7	.24
31	29.89	54	29.85	54.5	29.78	52	54.5	50	4.5	52.2	.15
Monthly range									55.5°		
Monthly mean										52.31°	
Monthly rainfall											3.57

Meteorological Record for June, 1885.

	8 A.M.		1 P.M.		6 P.M.		24 HOURS ENDING 8 A.M.				
Date.	Barometer.	Thermometer.	Barometer.	Thermometer.	Barometer.	Thermometer.	Maximum Thermometer.	Minimum Thermometer.	Daily range.	Daily mean.	Rainfall.
1	29.73	54.5°	29.72	58°	29.70	55.5°	61.5°	51.5°	10°	56.5°	–
2	29.74	60	29.78	66	29.84	56.5	65.5	50	15.5	57.7	–
3	30.05	55	30.08	58	30.07	60.5	61	49.5	12.5	55.7	–
4	30.03	62	29.95	74.5	29.90	63	74	54	20	64	.15
5	29.78	54	29.70	48	29.69	47.5	57	45.5	12.5	51.7	1.17
6	29.87	57	29.93	66	29.96	65	67.5	48	19.5	57.7	–
7	30.04	62	29.98	72	29.89	71.5	71	59	12	65	.07
8	29.64	68	29.51	81	29.49	76	81	50	31	65.5	.08
9	29.69	53	29.75	57.5	29.83	60.5	60.5	46	14.5	53.2	–
10	30.09	58	30.13	70.5	30.15	69	71.5	52.5	19	62	–
11	30.24	63.5	30.24	71.5	30.23	72.5	73	54.5	18.5	63.7	–
12	30.23	66	30.22	74.5	30.20	73	74	58	16	66	–
13	30.19	67.5	30.16	77	30.07	74.5	77	63	14	70	–
14	29.95	72.5	29.89	79	29.83	83.5	83	62	21	72.5	–
15	30.07	68	30.09	76.5	30.06	76	77	62	15	69.5	–
16	29.99	73	29.95	80	29.88	80.5	85.5	69	16.5	77.2	–
17	29.93	68	29.96	72.5	29.98	75	76	56.5	19.5	66.2	.02
18	30.13	66	30.16	74	30.16	68	74	57	17	65.5	–
19	30.24	71	30.24	75	30.20	73.5	75	60	15	67.5	–
20	30.21	72.5	30.20	82.5	30.17	77	81	61	20	71	–
21	30.16	66.5	30.15	75	30.09	74	75.5	61	14.5	68.2	–
22	29.89	68	29.77	77	29.78	73	78.5	50.5	28	64.5	.06
23	29.94	56	29.95	65.5	29.93	67	68	55	13	61.5	–
24	30.03	61.5	30.06	72.5	30.08	74	75.5	57	18.5	66.2	–
25	30.15	70	30.16	80	30.15	80	81	64	17	72.5	–
26	30.16	72	30.14	80.5	30.11	78	81	62.5	18.5	71.7	–
27	30.14	72	30.12	77.5	30.11	73	77.5	64.5	13	71	–
28	30.10	72.5	30.08	71.5	30.03	66.5	72.5	60.5	12	66.5	1.56
29	29.86	72	29.81	72	29.73	63	73.5	58.5	15	66	.15
30	29.70	64	29.67	70.5	29.67	63.5	70	52.5	17.5	61.2	.02
Monthly range									43°		
Monthly mean										64.93°	
Monthly rainfall											3.28

Meteorological Record for July, 1885.

	8 A.M.		1 P.M.		6 P.M.		24 HOURS ENDING 8 A.M.				
Date.	Barometer.	Thermometer.	Barometer.	Thermometer.	Barometer.	Thermometer.	Maximum Thermometer.	Minimum Thermometer.	Daily range.	Daily mean.	Rainfall.
1	29.69	56	29.69	62.5	29.71	62°	63.5°	52°	11.5°	57.7°	–
2	29.78	62.5	29.79	72	29.80	69	72.5	57.5	15	65	.01
3	29.82	65	29.86	68.5	29.88	63.5	71	54	17	62.5	.07
4	29.99	65.5	30.02	68	30.03	72	71	60	11	65.5	.01
5	30.13	64.5	30.15	69	30.16	72.5	73	60.5	12.5	66.7	–
6	30.24	70	30.26	71.5	30.24	66.5	73	64	9	68.5	.04
7	30.23	66.5	30.18	71	30.12	69	73	63.5	9.5	68.2	.15
8	30.09	74	30.08	81	30.06	79	82	72	10	77	–
9	30.01	76	29.92	84.5	29.88	74	85	68.5	16.5	76.7	.23
10	29.75	76	29.77	81	29.78	79	82	62	20	72	–
11	29.95	71.5	29.97	74.5	30.00	71	76.5	57.5	19	67	–
12	30.13	66.5	30.15	73	30.15	72	72	55.5	16.5	63.7	–
13	30.12	69	30.10	73	30.05	69	72.5	59	13.5	65.7	–
14	29.97	67	29.91	66.5	29.84	65	68	59	9	63.5	.23
15	29.88	69	29.92	77.5	29.94	76	78	62.5	15.5	70.2	–
16	30.06	70.5	30.13	78	30.14	75.5	79	63.5	15.5	71.2	–
17	30.17	73.5	30.13	80.5	30.05	81.5	82.5	73	9.5	77.7	–
18	30.05	81	30.05	84.5	30.05	81	84.5	59	25.5	71.7	–
19	30.15	68.5	30.14	69.5	30.06	71.5	74	66	8	70	–
20	30.02	75	30.03	82.5	30.01	79	81.5	73	8.5	77.2	–
21	29.93	76	29.90	83.5	29.79	84	90	67.5	22.5	78.7	–
22	30.01	74	30.06	79	30.08	82	81.5	62.5	19	72	–
23	30.24	71.5	30.26	74	30.25	72.5	75.5	66.5	9	71	–
24	30.23	74	30.17	82	30.12	76.5	82	71	11	76.5	–
25	29.97	77	29.94	82.5	29.90	76	83	73	10	78	.34
26	29.96	78.5	29.98	86.5	30.03	77.5	86.5	60	26.5	73.2	–
27	30.20	70	30.21	73.5	30.19	73	75	59	16	67	–
28	30.12	71	30.11	73	30.05	71	73	63.5	9.5	68.2	–
29	29.95	70.5	29.87	71.5	29.84	68	73.5	61.5	12	67.5	.41
30	29.90	66	29.91	70	29.92	70	71	62	9	66.5	–
31	29.94	67.5	29.94	71	29.93	69	71	63	8	67	.01
Monthly range									38		
Monthly mean										69.81	
Monthly rainfall											1.50

Meteorological Record for August, 1885.

	8 A.M.		1 P.M.		6 P.M.		24 hours ending 8 A.M.				
Date.	Barometer.	Thermometer.	Barometer.	Thermometer.	Barometer.	Thermometer.	Maximum Thermometer.	Minimum Thermometer.	Daily range.	Daily mean.	Rainfall.
1	29.98	67.5	29.99	71	29.98	66	71.5	63.5	8	67.5	1.31
2	30.04	69.5	30.07	71	30.08	66.5	71.5	62.5	9	67	.02
3	30.13	69	30.13	70	30.08	67	71.5	65	6.5	68.2	.09
4	29.82	68.5	29.78	77	29.77	76	77	64.5	12.5	70.7	.91
5	29.89	71	29.91	77.5	29.92	74.5	77.5	60.5	17	69	.02
6	30.09	63	30.10	67.5	30.10	66	69	52	17	60.5	–
7	30.13	63	30.14	68.5	30.13	65.5	67.5	62	5.5	64.7	–
8	30.19	67	30.22	67	30.24	68.5	69	57	12	63	–
9	30.25	65.5	30.25	68.5	30.23	66.5	68.5	61.5	7	65	–
10	30.18	67	30.18	74	30.14	74.5	76	67	9	71.5	–
11	30.15	73	30.14	81.5	30.12	78	81	67	14	74	.03
12	30.13	74.5	30.11	81.5	30.04	78.5	81.5	70.5	11	76	–
13	29.99	77.5	29.92	81.5	29.82	83	81.5	72.5	9	77	–
14	29.73	76.5	29.72	83	27.73	81	84	58.5	25.5	71.2	–
15	29.92	60	29.95	67.5	29.97	65	68.5	53	15.5	60.7	–
16	30.13	63	30.17	71	30.22	68	69.5	53.5	16	61.5	–
17	30.29	63.5	30.28	72	30.23	69	73	63	10	68	.02
18	30.10	69.5	30.03	79	29.97	77	79	66	13	72.5	.01
19	29.84	70	29.78	76	29.75	75	77.5	58	19.5	67.7	.07
20	29.91	61.5	29.95	68.5	30.00	64	69.5	51	18.5	60.2	–
21	30.18	62	30.21	68.5	30.16	68	71.5	62.5	9	67	.77
22	30.	66.5	29.98	77	29.99	77	80.5	62.5	18	71.5	.02
23	30.10	68.5	30.10	73.5	30.05	67.5	73	64	9	68.5	.16
24	29.88	68.5	29.80	78	29.73	73	80	62	20	72	1.70
25	29.83	62	29.88	58	29.87	57	62	48	14	55	.49
26	29.87	54	29.86	61.5	29.84	58	62	47	15	54.5	.02
27	29.97	52.5	30	60.5	30.03	56.5	63	44.5	18.5	53.7	–
28	30.10	53	30.10	62.5	30.10	60	65	51	14	58	–
29	30.12	55	30.14	63.5	30.14	62	65.5	52.5	13	59	.01
30	30.14	60.5	30.10	56.5	30.08	62	60.5	54	6.5	57.2	1.49
31	29.90	56	29.87	65	29.86	60	68	55	13	61.5	.02
Monthly range									39.5		
Monthly mean										65.62	
Monthly rainfall											7.16

Meteorological Record for September, 1885.

	8 A.M.		1 P.M.		6 P.M.		24 hours ending 8 A.M.				
Date.	Barometer.	Thermometer.	Barometer.	Thermometer.	Barometer.	Thermometer.	Maximum Thermometer.	Minimum Thermometer.	Daily range.	Daily mean.	Rainfall.
1	29.90	61°	29.89	68°	29.86	68°	72°	51.5°	20.5°	61.7	.01
2	29.91	56	29.96	58	30.02	58	63	44.5	18.5	53.7	–
3	30.15	53	30.17	62	30.15	62	66	53.5	12.5	59.7	–
4	30.12	62	30.10	66	30.02	66	73	62.5	10.5	67.7	.04
5	29.95	64	29.96	64	29.96	64	70.5	47	23.5	58.7	.03
6	30.08	53	30.10	60	30.12	60	65.5	47	18.5	56.2	–
7	30.18	52.5	30.21	61	30.21	61	66	49	17	57.5	–
8	30.23	59.5	30.22	60	30.16	60	65	54	11	59.5	.62
9	29.86	59.5	29.77	57	29.73	57	74	45.5	28.5	59.7	.21
10	29 93	47	30.05	54	30.09	54	60	41	19	50.5	–
11	30.20	52	30.24	56	30.24	56	60.5	42	18.5	51.2	–
12	30.25	53	30.25	59	30.24	59	63.5	51.5	12	57.5	–
13	30.20	59.5	30.16	64	30.05	64	70	59.5	10.5	64.7	–
14	29.95	66	29.88	75	29.87	75	79.5	63.5	16	71.5	–
15	29.88	67.5	29.87	74.5	29.84	74.5	78	60	18	69	–
16	29.89	61.5	29.88	62	29.92	62	70	49.5	20.5	59.7	–
17	30.13	54	30.19	58.5	30.22	58.5	63	49	14	56	–
18	30.22	61	30.17	69	30.12	69	73.5	54	19.5	63.7	–
19	30.09	60	30 07	73	30.06	68	73.5	48	25.5	60.7	–
20	30.18	52.5	30.22	56.5	30.24	54	57	43.5	13.5	50.2	–
21	30.28	50	30.27	58	30.20	58	62.5	48.5	14	55.5	–
22	30.03	55	29.90	66	29.72	62	66.5	48.5	18	57.5	.49
23	29.50	48.5	29.56	46	29.60	41	66.5	37.5	29	52	.02
24	29.66	42.5	29.73	55	29.80	53	57	43	14	50	–
25	29.99	51	30.16	54	30.23	51.5	56.5	41.5	15	49	–
26	30 34	48.5	30.35	60	30.32	58.5	63.5	50	13.5	56.7	–
27	30.25	56.5	30.23	65	30.22	58.5	65	55	10	60	–
28	30.23	57.5	30.25	60	30.24	55	60.5	52	8.5	56.2	–
29	30.24	57	30.23	63	30.21	57	64	48	16	56	–
30	30.13	54	30.11	63	30.10	54.5	63.5	46.5	17	55	–

Monthly range	42°		
Monthly mean		57.75°	
Monthly rainfall			1.42

Meteorological Record for October, 1885.

	8 A.M.		1 P.M.		6 P.M.		24 HOURS ENDING 8 A.M.				
Date.	Barometer.	Thermometer.	Barometer.	Thermometer.	Barometer.	Thermometer.	Maximum Thermometer.	Minimum Thermometer.	Daily range.	Daily mean.	Rainfall.
1	30.11	54°	30.14	63°	30.14	53.5°	63°	49.5°	13.5°	56.2°	–
2	30.15	56	30.15	57.5	30.12	55	57	55	2	56	.04
3	29.98	58	29 83	62	29.76	63.5	65	58	7	61.5	1.95
4	29.77	64.5	29.68	72.5	29.62	66.5	71	45	26	58	.05
5	29.98	50	29.99	58.5	30.00	53	58	43.5	14.5	50.7	–
6	30.07	48.5	30.08	53.5	30.08	48	51.5	34	17.5	42 7	.55
7	30.09	38.5	30.10	47	30.10	43.5	48	35	13	41.5	–
8	30.21	40	30.23	48	30.24	45	49	38.5	10.5	43.7	–
9	30 26	40.5	30.26	49	30.26	45	49	39	10	44	–
10	30.26	45	30.24	58.5	30.23	55.5	60	45	15	52.5	–
11	30.23	51	30.23	61	30.23	54.5	62	34	28	48	–
12	30 25	41	30.28	53.5	30.29	47	48.5	41	7.5	44.7	–
13	30.29	48	30.25	50	30.18	50	56	48.5	7.5	52.2	1 35
14	29.87	56	29.76	59.5	29.68	57	62.5	46.5	16	54.5	.25
15	29.70	51	29.71	61	29.74	56	62	42	20	52	–
16	29.84	46.5	29.84	56	29.87	51.5	57	41.5	15.5	49.2	–
17	30.01	45	30.04	55	30.08	52.5	56	46.5	9.5	51.2	–
18	30 12	51.5	30.11	62.5	30.11	55	63.5	50.5	13	57	–
19	30.14	56.5	30.20	63	30.20	64.5	64	52.5	11.5	58.2	–
20	30 27	55.5	30.27	62.5	30.27	59	64	54	10	59	–
21	30.20	56 5	30.09	63.5	29.98	61	63.5	40.5	23	52	.27
22	30.95	43.5	29.99	53.5	30.00	42.5	53.5	37.5	16	45.5	–
23	30 05	41.5	30.06	53	30.08	47.5	53	32.5	20.5	42.7	–
24	30.13	40	30.16	52.5	30.17	45.5	52.5	36	16.5	44.2	–
25	30.22	40.5	30.23	55.5	30 23	46	50.5	39	11.5	44.7	–
26	30.24	39	30.24	52.5	30 21	50.5	52.5	40.5	12	46.5	–
27	30.15	47.5	30 13	58.5	30.11	54	60	45	15	52.5	–
28	30.12	47	30 15	53	30.18	50	54	47.5	6.5	50.7	04
29	30.12	54	30.02	55 5	29.89	52	56	48	8	52	1.04
30	29.44	50	29.43	48.5	29.47	41	51	34	17	42.5	.31
31	29.67	34	29.80	44	29.89	38.5	44	26.5	17.5	35.2	–
Monthly range									44.5°		
Monthly mean										49.74°	
Monthly rainfall											5.85

Meteorological Record for November, 1885.

	8 A.M.		1 P.M.		6 P.M.		24 HOURS ENDING 8 A.M.				
Date.	Barometer.	Thermometer.	Barometer.	Thermometer.	Barometer.	Thermometer.	Maximum Thermometer.	Minimum Thermometer.	Daily range.	Daily mean.	Rainfall.
1	30.08	29	30.12	39.5°	30.19	42°	49°	29°	20°	59°	-
2	30.15	49	29.95	51.5	29.74	47.5	55	36.5	18.5	45.7	.44
3	29.75	40	29.75	49	29.76	43.5	49.5	37.5	12	43.5	-
4	29.82	40.5	29.86	46.5	29.91	42	48	40	8	44	-
5	29.98	48	30.01	61	30.03	55.5	62.5	48	14.5	55.2	-
6	30.11	54	30.15	55.5	30.17	51	56	49	7	52.5	.36
7	30.19	49	30.17	52	30.15	51	62	50	12	56	.22
8	30.05	61.5	30.02	66	29.97	57.5	64.5	52.5	12	58.5	.47
9	29.74	57.5	29.70	55.5	29.73	49	57.5	41	16.5	49.2	.07
10	29.77	42.5	29.76	49	29.75	43	49.	35	14	42	-
11	29.76	38.5	29.78	52	29.79	48.5	54.5	39.5	15	47	-
12	29.80	49.5	29.79	62	29.79	57	62	45	17	53.5	-
13	29.80	46.5	29.78	60	29.77	56	62	44.5	17.5	53.2	-
14	29.86	45	29.85	50	29.81	47	50.5	36	14.5	43.2	-
15	29.75	36.5	29.74	44	29.75	42	44.5	32.5	12	38.5	-
16	29.78	34	29.81	43	29.89	40	44	32.5	11.5	38.2	-
17	29.97	41	29.99	48.5	29.99	44	50	36	14	43	-
18	30.02	39	30.02	49	30.01	49.5	51.5	39.5	12	45.5	-
19	29.81	51.5	29.73	51	29.72	42	55.5	28.5	27	42	.20
20	29.77	29	29.80	40	29.81	36.5	42	29	13	35.5	-
21	29.81	33.5	29.81	39.5	29.81	37	38.5	33.5	5	36	-
22	29.87	34	29.88	39	29.89	38	40	34.5	5.5	37.2	.31
23	29.93	38	29.93	38	29.93	38	42	36	6	39	.27
24	29.93	39.5	29.93	38	29.93	40	46	38	8	42	1.48
25	29.80	45.5	29.72	45.5	29.68	43.5	45.5	29.5	16	37.5	1.25
26	29.96	29.5	29.80	30.5	29.83	30	31	24.5	6.5	27.7	.04
27	29.91	26	30.00	35	30.06	32	36	23	13.	29.5	-
28	30.13	24	30.14	39.5	30.14	35.5	41.5	23	18.5	32.2	-
29	30.16	23.5	30.15	35.5	30.15	33	36.5	25	11.5	30.7	-
30	30.15	30	30.15	39.5	30.15	35	40	27.5	12.5	33.7	.09
Monthly range									22°		
Monthly mean										43.04	
Monthly rainfall											5.20

Meteorological Record for December, 1885.

	8 A.M.		1 P.M.		6 P.M.		24 HOURS ENDING 8 A.M.				
Date.	Barometer.	Thermometer.	Barometer.	Thermometer.	Barometer.	Thermometer.	Maximum Thermometer.	Minimum Thermometer.	Daily range.	Daily mean.	Rainfall.
1	30.16	27.5°	30.19	27.5°	30.19	27°	28.5°	23.5°	5°	26°	–
2	30.17	23.5	30.15	32	30.12	30	33	24	9	28.5	–
3	30.04	32	30.01	40	29.97	36	40.5	25.5	15	33	–
4	29.90	25.5	29.89	34	29.89	36	46	26.5	19.5	36.2	.07
5	29.83	46	29.74	49.5	29.68	40	50.5	24.5	26	37.5	.06
6	29.63	26	29.65	30	29.65	30.5	32	20	12	26.	–
7	29.63	20	29.66	21	29.70	15.5	23	12	11	17.5	–
8	29.92	15.5	29.97	27	30.01	31	48	16	32	32	.02
9	30.06	48	30.03	51	29.96	54	56	47	9	51.5	.14
10	29.76	56	29.78	59.5	29.80	49.5	60	30	30	45	–
11	29.87	33	29.93	38	30.01	34	38.5	27	11.5	32.7	–
12	30.25	27.5	30.32	34	30.36	31	34	27.5	6.5	30.7	–
13	30.41	34	30.40	39	30.38	40	54	35	19.	44.5	.61
14	30.03	50	29.88	51.5	29.79	47.5	51.5	31	20.5	41.2	.13
15	29.76	31	29.80	31	29.87	28.5	32.5	26	6.5	29.2	–
16	30.09	26	30.12	38	30.15	33	39	23	16.	31	–
17	30.25	24	30.27	27	30.28	23.5	28	21.5	6.5	24.7	.21
18	30.30	23.5	30.29	29	30.27	28	36	27	9.	31.5	.23
19	30.15	35	30.11	36	30.06	36	38.5	27	11.5	32.7	.15
20	29.98	26.5	29.97	25.5	29.97	20	27	14	13.	20.5	–
21	29.99	15	29.98	27.5	29.97	31	35.5	16	19.5	25.7	–
22	30.01	19	30.06	30.5	30.10	32	39	20	19.	29.5	–
23	30.12	38	30.10	51.5	30.05	45	52.5	38	14.5	45.2	–
24	29.97	43	29.99	44.5	30.03	30	46	21	25.	33.5	–
25	30.20	22	30.22	27	30.23	21.5	27	13.5	13.5	20.2	–
26	30.25	13.5	30.25	17	30.24	21.	22	13	9.	17.5	.02
27	30.22	14.5	30.20	21	30.20	21	27.5	16.5	11	22	–
28	30.17	26.5	30.16	35	30.14	34	36	28	8	32	–
29	30.08	31.5	30.07	39	30.04	35	39	28.	11	33.5	–
30	30.09	29	30.10	44	30.11	39	45	31	14	38	–
31	30.12	39	30.10	43	30.04	43	44.5	40.5	4	42.5	.21

Monthly range . . . . 28.°
Monthly mean . . . . 32.°
Monthly rainfall 1.85

55
1912

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FIFTEENTH ANNUAL REPORT

OF THE

PUBLIC WATER BOARD

OF THE

CITY OF LYNN,

For the Year Ending December 31, 1886.

LYNN, MASS.:
WOODBURY S. PRENTISS,
1887.

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For the Year Ending December 31, 1886.

LYNN, MASS.:
WOODBURY S. PRENTISS,
1887.

H.L.M.

OFFICERS FOR 1886.

D. H. Sweetser, *President*,
For three years.

Albert A. Davis,
For two years.

Thomas B. Newhall,
For one year.

Alfred A. Mower,
For four years.

David Knox,
For five years.

Superintendent and Clerk—Daniel Walden.
Water Registrar—Frank McCullough.
Pumping Engineer—W. H. Messinger.
Foreman of Piping—Edwin Maxwell.
Foreman of Services—George Sanborn.
Inspectors—Winslow J. Rowell, Willis L. Snow, J. Frank Pool, Wm. B. Moulton.

PUBLIC WATER BOARD FOR 1887.

Albert A. Davis, for one year.
D. H. Sweetser, for two years.
Alfred A. Mower, for three years.
David Knox, for four years.
Edwin Bates, for five years.

ANNUAL REPORT.

Office of the Public Water Board,
January 3, 1887.

To the Honorable Mayor and City Council of the City of Lynn:

We hereby present the fifteenth annual report of the Public Water Board, and the accompanying reports of the Superintendent of the works and the Water Registrar, which contain full information in regard to the condition of the department, and the work that has been performed.

FINANCIAL CONDITION.

A material reduction in water rates went into effect July 1, 1885, so that the past year is the first full year in which our receipts have felt the effect of the reduced rates. Notwithstanding this reduction (about twenty per cent.), the increased consumption has been such, that the income from the sale of water has not only met the interest on the water debt, the repairs and running expenses, but over $32,000 has been carried to the sinking fund provided for the ultimate extinguishment of the water debt. This is a result that we could hardly have anticipated, and we congratulate our citizens upon this favorable and gratifying financial condition of the water department.

In our report of last year we alluded to what threatened to be a serious competition in supplying our citizens with water. A private corporation, with its works located near our borders, claimed, under its charter, the right to dig up our streets, lay its pipes, and sell water to our citizens in direct competition with this department. The Marblehead Water Company had already diverted from us several thousand dollars of water rates, and if we were powerless to prevent the further extension of its pipes, we had reason to fear that the costly works we had constructed, and the large debt we had incurred, in order to supply our citizens with water, would be likely to prove a serious burden to our tax payers. Happily, however, a limit has been placed upon the powers claimed by the Marblehead Water Company. An appeal was made to the Legislature to so amend its charter that it be restrained from further opening up our streets. After an exhaustive hearing before the committee on water supply, and a prolonged and persistent opposition by the company, which fought the petition of the city at every stage in the Legislature, the justice of our claim was conceded and the petition was granted, so that we have nothing more to fear from the competition of the Marblehead Water Company within the limits of our city, unless the aldermen should grant to it the privilege of digging up our streets.

COST OF THE WORKS.

Total gross cost of works to Jan. 1, 1886		$1,410,787 87
Add construction account of 1886		54,036 65
Total gross cost of works to Jan. 1, 1887		$1,464,824 52
Less receipts for labor, pipe, etc.	$56,016 16	
Less premium on bonds sold	11,171 67	
Less income in excess of interest payments and cost of maintenance *	183,663 01	250,850 84
Total net cost of works to Jan. 1, 1887		$1,213,973 68

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* This amount includes no appropriations to the Water Loan Sinking Fund, made by the City Council, or earnings of the fund since it was established.

OUR WATER SUPPLY.

After an experience of two years with our new supply, we are enabled to form some estimate of the quantity of water which can be made available. In the past two years the rainfall has been more than the average, and the conditions have been favorable for the collection of water. The estimated yield of Hawkes and Penney brooks for 1885 was 1,382,000,000 gallons, while the quantity available for use was 409,000,000 gallons. The yield of the brooks the past year has been 1,206,000,000 gallons, and the quantity utilized was 237,000,000 gallons, showing the yield for the two years to have been 2,588,000,000 gallons, while all that could be made available was 647,000,000 gallons, or about one-fourth of the quantity the brooks yield. In average years we can rely upon the brooks to furnish our supply for about six months of the year, and for the remaining six months the water stored in Breed's and Birch ponds is our only resource.

As we have stated before, the past two years have been years of large rainfall, it being 45 inches in 1885, or 3 inches more than the average, and 48¼ inches in 1886, or 5 inches above the average. Notwithstanding this large rainfall, the highest point reached by the water in Birch Pond was 18 feet, which showed conclusively that, with the present consumption, our ponds could not be filled from their own watershed, even if the brooks should furnish our supply for six months in the year. It was therefore the unanimous opinion of the Board, in view of the rapid increase in the consumption of water, that some action should be immediately taken to store some of the water that runs to waste in the winter and spring months from Hawkes and Penney brooks.

The present storage capacity of Birch Pond is about 400,000,000 gallons, and in order to have full ponds to draw from when the canal stops running, the Board decided to put in a steam pump at the gate-house at the westerly end of Birch Pond, in order to pump some of the water from the canal that would otherwise run to waste in the spring and winter months. This action was believed to be necessary if we would avoid being out of water, perhaps in the near future. The Board have therefore contracted with John Post, Jr., & Co., for the erection of a steam engine and boiler of about 60 horse power, and a Webber centrifugal 15″ pump, capable of pumping from 10 to 15 million gallons of water daily from the canal into the pond, when the canal will yield that quantity. This is, of course, a temporary expedient; for, when we consider that for the past five years the consumption of water has increased more than 50%, and last year the increase was 12½%, we believe it will soon be found necessary to construct storage basins to save the water that now runs to waste.

Allowing that the canal will furnish the supply for the city six months in the year, we have for the other six months to depend upon the water stored in Breed's and Birch ponds. The storage capacity of these ponds, above a plane of six feet, is 561,786,000 gallons. An allowance of 20,000,000 gallons for the loss by evaporation above the rainfall for the six months will leave 541,786,000 gallons available for use during the summer and fall months. The consumption of water in 1886 for the months named was 443,336,316 gallons. Bearing in mind that the consumption for the past five years has increased 50%, and last year it was 12½% more than the previous year, we think, in making estimates for the future use of water, it would not be safe to call the yearly increase less than 10%. Upon this basis, there will be required for the city's consumption for the six months in which we must rely upon our storage, as follows: In 1887, 487,669,947 gallons; in 1888, 536,436,941 gallons, and in 1889, 590,080,635 gallons, or more than 48,000,000 gallons in excess of the quantity in store, even if we start with full ponds. To be sure, we may have years of heavy rainfall, and good luck may save us from being short of water in 1889, or the consumption may not increase as rapidly as we have estimated, but we cannot consider it the part of prudence to rely upon such conditions.

We think these estimates prove conclusively that we cannot with safety much longer delay the construction of storage basins. We are liable to soon be in pressing need of the water that is now, under our present system, so lavishly wasted.

As it will take more than one season to properly construct the dams and perform the necessary work connected therewith, we would respectfully urge upon the City Council the importance of giving the subject careful and early consideration. We would also call attention to the facts and figures presented in the Superintendent's report, under the head of storage, which confirm what we have said upon this question, and clearly show that it will not be safe to delay the matter.

Much complaint has been heard of late of the quality of the water, since we began to use it direct from the canal. This is an ever-recurring trouble, and an unavoidable one, where the water flows direct from the brooks into the pumping well. It is inherent to the canal system. Water needs the purifying influences of sun and air; and, as we have said in a previous report: "While we believe that the nature of the water-shed, where our water is gathered, guarantees its freedom from impurities of a harmful character, yet the objectionable taste cannot be avoided unless it be stored for a while in basins." The rains and melted snows collected from the hillsides, swamps and pastures, and pumped directly into the distributing pipes, must be unpalatable. It has not lost the taste and smell of the woods and pastures where it is gathered. It has no time for purification and subsidence, and will never be satisfactory to our people until it has been purified by storage.

STREET MAINS.

We would respectfully refer to our remarks in last year's report, in regard to the laying of water pipes: "When applications for water pipes are referred to the Water Board, careful estimates are made of the cost and of the probable income for the use of water; and in all cases where the income is found to be 5% on the cost, recommendation is made that the pipes be laid, relying upon the future growth of the locality to furnish some compensation for the water supplied. This rule, if followed, would seem to be a just one for tax-payers and water-takers, as well as a liberal one for the residents on the new streets desiring water."

We would, therefore, again recommend that the question of deciding where pipes should be laid be left in the hands of the Water Board. They have the facts in their possession, and are the best judges of the matter, and it would be for the best interest of the department if the question of determining where street mains should be laid should be left with them.

LAND DAMAGES.

The questions involved in the taking of twenty separate parcels of land from eleven different owners, for the construction of the tunnel and canal, have been settled without recourse to the courts in any instance. This was a work involving much time and labor, and we believe the interests of the city have been served by the settlements effected.

HIGH SERVICE.

The high service for distributing water to the Highland district has been completed, and we think no further complaints will be heard of the lack of water for this locality.

At a time when estimates in regard to cost are so misleading, we are glad to be able to state that the entire cost of the high service has been several thousand dollars less than the estimates made for the expense of the work.

PERSONAL.

This department has experienced a serious loss in the retirement of Thomas B. Newhall from the Board. His long experience, combined with his legal knowledge, rendered his services of great value to the city, and we would testify to our respect and appreciation of the value of his judgment and advice in the various matters which we, as a Board, have had to deal with.

For the Public Water Board,

D. H. SWEETSER, *President.*

REPORT OF THE WATER REGISTRAR.

D. H. Sweetser, Esq., President Public Water Board:

SIR,—In compliance with the city ordinance, I take pleasure in presenting herewith the report of the Water Registrar for the year ending December 31, 1886:

SERVICES.

Whole number of services Jan. 1, 1886, 6,919; new services put in during year, 455; total number Jan. 1, 1887, 7,374; new services let on during year, 444; services shut off during the year for non-payment, 31; services let on by payment of rates and fines, 20; services let on for other parties by change of ownership or occupancy, 10; shut off by request, for vacancy, 87; let on premises re-occupied, 125; services discontinued during the year, 5. Services put in at East Saugus during the year, 3; making the whole number Jan. 1, 1887, 72. Services put in at Swampscott during the year, 41; making the whole number Oct. 1, 1886, when the contract expired, 92.

The ratio of increase yearly in the number of services for the past 11 years is as follows:

1876 . . .	6.54 per cent.	1882 . . .	9.92 per cent.
1877 . . .	7.60 " "	1883 . . .	10.80 " "
1878 . . .	6.14 " "	1884 . . .	8.62 " "
1879 . . .	6.04 " "	1885 . . .	6.36 " "
1880 . . .	8.75 " "	1886 . . .	6.58 " "
1881 . . .	10.25 " "		

RECEIPTS FOR THE YEAR 1886.

For the use of water for all purposes	$116,044 71
For wood	141 75
For rent, grass, fruit, etc.	60 76
For seal locks	3 50
For fines, shutting off and letting on	59 00
For summons	192 00
For extra pipe, labor, etc.	4,402 37
	$120,904 09

The whole amount of which has been paid into the city treasury, and the Treasurer's receipts taken therefor.

There is due and uncollected on ordinary water rates	$593 68
Meter rates	4,018 83

EXPENDITURES FOR THE YEAR 1886.

MAINTENANCE.

Salaries and office expenses	$5,126 18
Repairs on services	2,428 09
Repairs on mains, hydrants and gates	2,496 35
Repairs on meters	385 83
Repairs on engine-house	98 70
Repairs on engines and boilers	206 43
Repairs and labor on tubular wells	455 41
Stable and workshop	1,202 17
Pumping, wages, coal, oil, etc.	5,408 16
Breed's Pond	218 86
Birch Pond	36 25
New supply	1,047 27
Reservoir	103 63
High service	25 74
Damages	60 00
Total Maintenance	$19,299 07

CONSTRUCTION.

Services and court-mains	$10,081 56
Mains, hydrants, and gates	5,319 62
High service	21,534 27
Meters	1,042 33
Tubular wells	64 25
Engine house	180 92
Birch Pond dam	4,921 14
Breed's Pond	188 64
New supply	10,532 79
Stable and workshop	171 13
Total construction	$54,036 65

COMPARATIVE STATEMENT OF REVENUE FOR 1886.

Amount due and uncollected Jan. 1, 1887	$4,612 51
Amount collected for the year	116,501 72
	$121,114 23
Deduct amount due Jan. 1, 1886	4,738 53
Revenue for 1886	$116,375 70
Revenue for 1885	110,089 11
Increase of revenue for 1886	$6,286 59

STATEMENT OF INTEREST, MAINTENANCE, AND REVENUE FOR 1886.

Revenue for 1886		$116,375 70
Interest	$64,807 25	
Maintenance	19,299 07	
		$84,106 32
Excess of revenue over interest and maintenance		$32,269 38

Following will be found the usual tables, exhibiting the number of dwellings, families, stores, factories, etc., supplied with water, the class of premises to which meters are attached, the number and kind of fixtures, the yearly revenues of the department, etc., etc.

Respectfully submitted,

FRANK McCULLOUGH,
Water Registrar.

STATEMENT

SHOWING THE CLASS OF PREMISES TO WHICH METERS ARE ATTACHED.

CLASS.	SIZES.									
	½	⅝	¾	1	1¼	1½	2	3	4	Total
Bathrooms	–	1	–	–	–	–	–	–	–	1
Brewery	–	–	1	–	–	–	–	–	–	1
Brickyards	–	–	–	2	–	–	–	–	–	2
Churches	–	1	–	–	1	–	–	–	–	2
City stable	–	–	–	1	–	–	–	–	–	1
Dwellings	–	3	3	–	–	–	–	–	–	6
Elevators	–	–	–	–	–	–	1	–	–	1
Engines	–	4	6	16	1	4	–	–	1	32
Factories	5	12	47	38	3	–	–	–	–	105
Fire engine houses	–	–	1	1	–	–	–	–	–	2
Foundries	–	–	–	1	–	–	–	–	–	1
Gas works	–	–	–	–	–	2	–	–	–	2
Halls and buildings	–	2	6	10	–	–	–	–	–	18
Hotels	–	1	3	2	–	2	1	–	–	9
Laundries	–	1	5	1	–	–	–	–	–	7
Livery stables	–	4	5	2	–	–	–	–	–	11
Medical laboratory	–	–	–	1	–	–	–	–	–	1
Printing offices	–	1	–	–	–	–	–	–	–	1
Railroads	–	1	7	3	–	–	1	1	1	14
Saloons	–	–	–	2	–	–	–	–	–	2
Tugs and vessels	–	–	–	–	–	–	1	–	–	1
Motors 5	–	–	–	–	–	–	–	–	–	–
	5	31	84	80	5	8	4	1	2	220

STATEMENT

SHOWING THE NUMBER AND KINDS OF FIXTURES CONTAINED WITHIN THE PREMISES OF WATER TAKERS, DEC. 31, 1886. COMPARED WITH THE PREVIOUS YEAR.

KINDS OF FIXTURES.	1885.	1886.	Increase.
Faucets	15,238	16,559	1,321
Bath tubs	1,073	1,238	165
Water closets	3,216	3,597	381
Urinals	197	211	14
Steam heaters	21	141	120
Hand hose	1,858	2,205	347

STATEMENT

SHOWING THE YEARLY REVENUE OF THE DEPARTMENT SINCE THE FIRST INTRODUCTION OF WATER INTO THE CITY IN 1871.

From October 1, 1871, to January 1, 1872	$8,989 00
From January 1, 1872, to January 1, 1873	27,568 16
From January 1, 1873, to January 1, 1874	47,992 61
From January 1, 1874, to January 1, 1875	53,545 61
From January 1, 1875, to January 1, 1876	52,553 26
From January 1, 1876, to January 1, 1877	60,867 12
From January 1, 1877, to January 1, 1878	64,002 50
From January 1, 1878, to January 1, 1879	67,570 14
From January 1, 1879, to January 1, 1880	73,949 80
From January 1, 1880, to January 1, 1881	79,635 12
From January 1, 1881, to January 1, 1882	80,967 76
From January 1, 1882, to January 1, 1883	94,419 52
From January 1, 1883, to January 1, 1884	98,893 54
From January 1, 1884, to January 1, 1885	114,903 86
From January 1, 1885, to January 1, 1886	110,089 11
From January 1, 1886, to January 1, 1887	116,375 70
	$1,152,322 81

DETAILED STATEMENT SHOWING COST OF WORKS TO JAN. 1, 1887.

Breed's Pond and land	$38,003 15	
Birch Pond and land	86,657 34	
Pipe conduit and right of way	43,785 98	
Reservoir and land	131,581 49	
Force main and land	24,614 00	
Engine house and land	56,674 05	
New supply and land	133,998 61	
Engines and boilers	71,998 00	
Tubular wells	7,382 04	
Mains, hydrants and gates	585,245 58	
Services and court mains	177,511 49	
Meters	8,652 16	
Workshop and stable	1,957 12	
Engineering	8,564 99	
High service	21,534 27	
		$1,398,160 27
Less amount received for extra pipe, labor, etc.		56,016 16
Total net cost to date		$1,342,144 11

REPORT OF THE SUPERINTENDENT.

LYNN, January 3, 1887.

D. H. Sweetser, Esq., President of the Public Water Board:

SIR, — In compliance with the city ordinance I respectfully submit herewith the Annual Report of the Superintendent for the year 1886.

NEW SUPPLY.

From the 1st of January until the 12th of February, the two brooks forming the new supply furnished most of the water used by the city. On the 11th and 12th of February, a rainfall of 5.69 inches, falling on a large body of snow, caused a heavy freshet in the brooks, washed away the culvert under the canal at North Saugus, together with thirty or forty feet of the canal embankment, rendering the Hawks Brook canal entirely useless for the remainder of the season. By putting in a temporary dam above the junction of the Penney Brook canal, the waters of that brook were saved for the use of the city.

The latter part of February it became apparent, from experiments made, that Birch Pond was losing water at the upper end, and the canal and tunnel were drawn off in order to locate the leak. Upon examination it was found that the conduit, between the gate-house and the tunnel, was leaking at nearly every joint for a length of eighty feet from the gate-house, but that the remainder of the conduit and the tunnel was tight and in good order. The water from the pond by this means found its way into the tunnel, and thus furnished a portion of the daily supply to the city, in place of the full supply coming from the canal.

The amount received from the brook gradually diminished till the first of June, when it ceased. In the fall the first water from the new supply was Oct. 31. The first pumped into the reservoir was on the 9th of December. The first day a full supply was obtained was Dec. 20, fifty days later than in 1885. The total amount received from that source for the year, including the amount received in Birch Pond, has been 237,674,062 gallons. During the summer a new double culvert, of more than double the capacity of the old one, has been built, the broken canal banks rebuilt, and the canal repaired where it was required, and put in good condition.

From the gate-house, at the head of Birch Pond, a trench was excavated across the valley to the high ground on either side—about 155 feet in length—down to the solid ledge, 22 feet in depth at the gate house, 18 feet on the westerly side where the ledge rises abruptly to the surface, and 4 feet at the easterly end. Two rows of sheet piling were placed in this trench, three feet apart, and this space filled with clay puddle, well worked and thoroughly compacted, and every pains taken to make a perfectly tight job. It is hoped there will be no further loss of water from this cause.

PONDS.

The waste-way at Birch Pond dam, which was unfinished at the date of last report, was finished in the early spring. The refuse material, accumulated below the dam, has been utilized to fill the piece of swamp between the dam and the road. The grounds below the dam have been graded, also at the upper end, where the cut-off wall has been put in, the curbing at the dam finished, the embankment sown down to grass, and the grounds fenced in the whole length of the pond, giving to the locality a more finished and attractive appearance.

At Breed's Pond an iron fence has been set in the curbing on the wall at the upper end of the pond; also along the road at the dam a trench has been excavated, on the inside of the dam below the foundation of the curbing, and filled with concrete, which it is expected will stop all percolation at that point when the pond is full. It is hoped that the road from the dam to Oak street will be finished next year, the wall extended from its present terminus to Oak street, and the grounds below the dam properly fenced.

We have scarcely ever had so favorable a season for filling the ponds as the last season. The early and abundant rains of the fall, and the heavy snows and rains of the winter, caused a very large flow of the streams, filling most of the ponds in this vicinity by the middle of February. Breed's Pond was full and running to waste on the 12th of that month. Birch Pond, on account of its large capacity in proportion to its watershed, was not filled; the highest point reached was 18 feet on the 16th of April. Except for the loss by the leak in the conduit, the water might have reached 20 feet. From the 12th of December till the 15th of April, the water was running from Breed's Pond into Birch Pond all the time that the engine was not at work. When the engine is pumping, no water can be transferred from one pond to the other. It being evident that Birch Pond cannot be filled by its own watershed, it being 2 feet 2 inches lower than last year at same date, it is proposed to erect a centrifugal pump at the upper gate-house, to pump the surplus water from the canal into the pond, hoping thereby to be able to fill the pond.

Breed's Pond, on December 31, contained 12 feet 11½ inches; in 1885, 17 feet 10 inches. Birch Pond contained 9 feet 9 inches; in 1885, 11 feet 11 inches. The rainfall for the year has been

48.26 inches. The yield from the watersheds of both ponds has been 462,262,567 gallons, exclusive of water surfaces, equal to 40.04 per cent. of the rainfall. The same percentage of yield for the watershed of the new supply would give for that source 1,206,731,398 gallons. The consumption for the year has been 772,449,137 gallons, an average of 2,116,299 gallons per day.

TUBULAR WELLS.

The tubular wells were put in operation on the 5th of November, and pumped into Breed's Pond until the 15th, when the water was pumped into the river, for the purpose of enabling C. J. H. Woodbury, C. E., to make some chemical experiments to be used as evidence in a suit against the city for an infringement of patent on the wells. As soon as the experiments were concluded the pumping was discontinued, and the engine and boiler were put in condition to be ready for future use. The old wells, put in in 1880, appear to be in poor condition; if it should become necessary to put them in service again, they will require a careful examination.

RESERVOIR.

Early in June the water in the reservoir was drawn down for the purpose of entering the 12-inch pipe for the new High Service. A trench was cut through the embankment, on the easterly side, about 5 feet above the bottom of the reservoir; the pipe was laid in this trench, the end protected by a small brick chamber fitted with screens, for the exclusion of fish, and the pipe well bedded and covered with concrete, to prevent leakage. In back-filling, the greatest care was taken in putting in the puddle-wall of clay, and connecting it with the old puddle. When the reservoir was again filled, it was found to be perfectly tight. While the water was down, the paving on the inside slope was carefully repaired. It was very gratifying to find the bottom, so far as it was exposed, clean and free from any deposit of sediment from the water, after thirteen years of use, which shows the great advantage of the ponds for the subsidence and bleaching of the water.

PUMPING STATION.

The roof of the pumping station has been repaired and painted, the boilers and settings have required some necessary repairs; the engines have not required any repairs for the year beyond what could be done by the engineer in charge. The Dean engine has not been in use for the year, but is kept in constant readiness for use. The pumping has all been done by the Leavitt engine. Under the management of Mr. Messinger, it has been run during the year 3,753 hours, and has made 4,146,933 revolutions, pumping 773,610,353 gallons into the reservoir, with an expenditure of 1,102,500 pounds of coal, including the heating of the building, an average of 1,169.43 gallons, raised 100 feet high, per pound of coal, with an average duty for the year of 101,552,587 feet pounds.

HIGH SERVICE.

In accordance with the order of the City Council, passed October 27, 1885, a 12-inch pipe, for the special use of the Highlands, has been laid in as direct a line as possible from the reservoir to the highest portion of the Highlands, at the junction of Bay View avenue and Grant street, and continued from thence through Bay View avenue and Hollingsworth street to Rockaway street, and the pipe connected with all the pipes in that district. Gates have been inserted in all the streets where pipes are laid, at about 100 feet elevation above marsh level, thus dividing the higher part from the regular city service. This pipe will supply the highest points in the district; and as the population will have to increase to three or four times the present numbers before the reduction in head, from the increased consumption, will become annoying, it will afford a sufficient supply for domestic use for many years to come. Provision has been made, however, by placing a **Y** in the pipe, near the reservoir, to connect at any time, when it may become necessary, with a small reservoir, or a stand pipe, on the top of the hill above the reservoir, and procure all the head desired, without making any alterations or in any way disturbing this pipe. Provision has also been made to utilize this pipe in case of a large fire in the business portion of the city. A connection has been made at the intersection of Western avenue and Washington street with the 12-inch pipe leading to the centre of the city, and by opening a 12-inch gate the full capacity of this pipe will be added to the present supply.

To facilitate the working of this line, in making connections or repairs, it has been divided into seven sections, as near an average length as the contour of the line would admit, with a 4-inch blow-off and a 2-inch automatic air-valve on each section.

The connection with the reservoir, and a section through the swamp at Holder's Pond, and all the connections, have been done by the department employees; the other portions were done by contract. The work was all finished and the water let on October 23.

PIPES.

The total amount of pipe laid during the year has been 3 miles, 2,654 feet, viz.: On the high service 9,601 feet of 12-inch, 31 feet of 8-inch, 65 feet of 6-inch, 41 of 4-inch, all of cast iron, and 54 feet of 4-inch cement lined. On twenty different streets there has been laid 6,241.7 feet of 6-inch, and 817.8 feet of 4-inch cast iron pipe. On ten courts 1,029.8 feet of 2-inch lined pipe, and 613 feet of smaller sizes have been laid as mains.

The total number of gates of all sizes set this year is 48; 15 have been set on the high service, 26 on the new pipe laid this year, and 7 on the different streets in the Highland district, to separate the new high service from the general distribution; 15 new hydrants have been set in connection with new pipe.

Four hundred and forty-two new services, and 13 to replace others of a smaller size, have been put in this year, of an aggregate length of 21,157 feet. Forty-one services were put in Swampscott, and 3 in East Saugus, of an aggregate length of 2,872 feet, which have been paid for by the owners of the estates.

During the year 39 new meters have been set, 40 have been taken out, repaired and reset, and 12 have been discontinued; 332 corporations, that had become clogged with rust, have been dug up and drilled out; 23 new stop and waste cocks have been put in to replace broken ones, and 22 new connections for service pipes put in for the same cause; 14 services have been changed, and 15 private hydrants repaired; 46 services repaired on account of being broken by the new sewers; 276 stop boxes, 14 meter boxes and 16 gate boxes, found rotten, have been taken out and replaced with new ones; 3 hydrants have had to be replaced with new ones; also two broken gates have been replaced with new ones, aud one gate has been changed for a larger size; 137 leaks on pipes, hydrants and gates have been repaired during the year.

STORAGE.

For about six months in the year, varying in different years, according to the rainfall, from five to seven months, the water required for the daily consumption of the city can be drawn directly from the flowing streams which furnish the new supply;

for the balance of the year we must rely upon the surplus water which has been stored in the ponds. For the five months, from June 1 to November 1, this is the only reliance. From November 1 to the middle of December, possibly later, the supply is taken partly from the streams, and the balance from the storage. It becomes, therefore, a matter of the utmost necessity to provide sufficient storage capacity to meet the varying requirements, in order to prevent the calamity of a water famine.

The present storage capacity of our ponds, above a plane of 6 feet, is 561,786,842 gallons. Correcting the storage, for the loss from evaporation, for the five months from June 1st to November 1st, the available storage will be 540,703,927 gallons.

The year 1885 was a remarkably favorable one for the canal. It furnished the supply to the city, wholly or in part, from January 1 to June 7, and from November 1 to December 31, a period of 219 days, leaving only 146 days in which the whole was taken from the ponds. In 1884 the first water used from the canal was on December 16, 45 days later than in 1885, which would give 174 days to be supplied from the canal, and 191 days to be supplied from the ponds. One hundred and ninety-one days may therefore be taken as the maximum time in which the whole supply must be taken from the ponds, and 146 days as the minimum, and 169 days as the mean time.

In 1880 the average daily consumption, during the five months

Board of Health, making it obligatory to connect all dwellings with the public sewers, where such sewers exist, and the constant demand for their extension, renders it almost certain that the percentage of increase will not be reduced during the five years from 1885 to 1890.

Allowing the same relative increase in the daily consumption in the five months from June 1 to November 1, the consumption in 1888 will be 2,637,979 gallons, and the maximum time of 191 days' use from the ponds will require 491,853,989 gallons, leaving a surplus of only 48,849,938 gallons, or 18 days' supply on hand. In 1889 the consumption for the same months will be 2,840,901 gallons per day, and the maximum time of 191 days will require 542,612,091 gallons, being a deficit of about 2,000,000 gallons. The average time of 169 days will require 474,112,269 gallons, leaving a surplus of only 66,591,658 gallons, or 23 days' supply on hand.

In 1890 the daily average for those months will reach 3,043,822 gallons, and the quantity required for the average time of 169 days will be 514,405,918 gallons, leaving only 26,298,009 gallons, or 8 days' supply on hand. If this should prove an unfavorable year, requiring the maximum supply of 191 days from the ponds, the quantity required would be 581,370,002 gallons, or more than 40.000,000 gallons beyond the capacity of the ponds. If, on the other hand, it should prove a very favorable year, requiring the supply from the ponds, for the minimum time of 146 days, the quantity would be 444,305,915 gallons, or 31 days' supply only, and this is the best that can be expected under the most favorable circumstances in 1890. In calculating the necessary storage required to insure the city against the danger of a short supply of water, the maximum time of the required supply from the ponds must be taken, otherwise a water famine is almost sure to be the result.

This estimate is based upon the assumed average increase in the consumption, being relatively the same as from 1880 to 1885, that the canal will furnish the full supply during the time it is in use, and that both ponds will be full on the first day of June in each year. If they are not full, the danger is increased in proportion to their deficiency. This estimate shows the following facts: that if 1888 should prove an unfavorable year, similar to 1883 or 1884, the storage, provided the ponds are full, would be just sufficient to carry us through, leaving but 18 days' supply on hand; that in 1889 an unfavorable season would exhaust the entire supply, and with an average season only a small surplus would be left on hand. If the unfavorable season should be delayed till 1890, unless some provision is made previous to that time, the city would be in a worse condition than ever before, and with a very favorable season we shall barely escape from a short supply.

In view of these facts, and considering that it will probably require two working seasons to make the necessary additions and connections required to place the water supply of the city upon a basis equal to its growing wants, prudence would require that the question of increase of storage be given early attention.

Respectfully submitted,

DANIEL WALDEN,

Superintendent.

TABLE I.

Record of the Leavitt Engine for the Year Ending December 31, 1886.

DATE.	No. of pumping days.	Average pumping time per day.	Total pumping time per month.	Number of revolutions per month.	Average revolutions per minute.	COAL CONSUMED.				Ashes and cinders.	Ashes and cinders.	Gallons pumped per month, allowing 4 per cent. for loss of action in the pump.	Average number of gallons pumped per pound of coal.	Average number of gallons raised 100 feet high per pound of coal.	Average head against the pump.	Average duty in lbs. of water raised one foot high per 100 lbs. of coal, no deduction for ashes and cinders.	Average duty in lbs. of water raised one foot high per 100 pounds of coal, the ashes and cinders deducted.	Oil.	Waste.
						Raising steam.	Pumping.	Banking.	Total.										
Month.	Days	H.M.	H. M.	Rev.	Rev.	I bs.	Lbs.	Lbs.	Lbs.	Lbs.	Percent	Gallons.	Galls.	Galls.	Feet.	Pounds.	Pounds.	Gal.	Lbs.
January . .	26	11.21	295.00	322,064	18.19	7,800	74,950	5,000	87,750	10,880	12.40	60,081,039	684.6	1,145.54	167.33	99,477,803	113,557,515	8	10
February .	22	11.38	256.00	282,128	18.43	6,600	66,450	4,650	77,700	7,770	9.74	52,630,977	677.3	1,130.68	166.94	98,182,779	109,091,977	7	10
March . . .	26	11.32	300.00	326,226	18.12	7,800	74,950	5,200	87,950	9,100	10.34	60,857,460	691.9	1,153.74	166.75	100,187,109	111,749,603	8	10
April . . .	23	11.29	264.00	290,626	18.35	6,900	66,800	4,600	78,300	7,900	10.09	54,216,280	692.4	1,155.89	166.94	100,365,130	111,627,695	8	10
May	24	11.24	273.40	300,222	18.28	7,200	69,600	4,800	81,600	8,920	10.93	56,006,414	686.3	1,148.80	167.10	99,583,713	111,804,210	8	10
June	20	16.00	320.00	354,491	18.46	6,200	83,000	3,200	92,400	12,560	13 56	66,130,271	715.6	1,189.11	166.17	103,265,604	119,510,794	8	10
July	26	15.55	414.00	459,852	18.51	7,800	105,350	5,000	118,150	12,390	10.46	85,785,387	726.0	1,208.06	166.40	104,908,359	117,217,518	8	10
August . .	26	13.44	357.00	398,777	18.62	7,800	90,900	5,200	103,900	8,900	8.56	74,391,843	721.7	1,199.25	166.17	103,308,725	112,987,121	9	11
September	26	13.30	351.00	392,067	18.62	7,800	88,950	5,200	101,950	10,530	10.32	73,140,098	717.4	1,196.26	166.75	103,872,881	115,837,237	8.5	10
October . .	26	12.00	312.00	348,452	18.61	8,000	79,450	5,000	92,450	6,550	7.08	65,003,720	703.1	1,170.80	166.52	101,663,047	109,415,002	8	10
November	25	11.44	293.30	320,134	18.18	7,500	73,300	5,000	85,800	7,010	8.17	59,720,997	690.0	1,148.98	166.52	100,640,223	109,581,560	8	10
December .	26	12.11	316.50	351,894	18.51	8,000	81,550	5,000	94,550	7,800	8.25	65,645,828	694.2	1,155.98	166.52	100,386,984	109,413,028	7	10
Totals and averages.	296	12.41	3,753.00	4,146,933	18.42	89,400	955,250	57,850	1,102,500	110,310	10.00	773,610,314	701.6	1,169.43	166.68	101,552,587	112,843,032	95.5	121

Cost of Pumping with the Leavitt Engine for the Year 1886.

505,700 pounds of coal, at $4.35 per ton	$1,099 90
596,800 pounds of coal, at $3.57 per ton	955 29
12,000 pounds of coal, at $4.05 per ton	24 30
1 cord of wood	4 50
Oil, waste, packing and small stores	295 78
Repairs to boilers, furnaces, etc.	294 92
Insurance	32 25
Wages of engineer and firemen	2,833 13
	$5,540 07

Cost of raising one million gallons to the reservoir	$7 17.21
Cost of raising one million gallons one foot high	0 04.3

TABLE II.

SHOWING THE CONSUMPTION OF WATER FOR THE YEAR ENDING DECEMBER 31, 1886.

	Monthly consumption.	Average consumption per day.	Average daily increase.	Average daily decrease.	Average to each consumer.	Average to each inhabitant.
Month.	Gallons.	Gallons.	Gallons.	Gallons.	Galls.	Galls.
January . .	59,629,844	1,923,543	107,126		44.8	41.9
February .	54,043,287	1,930,117	6,574		45.0	42.1
March . . .	58,929,492	1,900,951		29,166	44.3	41.4
April . . .	55,247,584	1,841,586		59,365	42.9	40.1
May	56,585,567	1,825,321		16,265	42.6	39.8
June . . .	66,638,299	2,223,360	398,039		51.4	48.4
July	82,883,771	2,673,670	450,310		61.1	58.3
August . .	76,975,957	2,483,095		190,575	57.4	54.1
September .	71,404,550	2,380,152		102,943	55.0	51.9
October . .	67,247,276	2,169,267		210,885	50.3	47.3
November .	58,186,463	1,939,549		229,718	45.2	42.3
December .	64,677,047	2,086,356	146,807		48.3	45.5
Totals and Averages.	772,449,137	2,116,299			49.0	46.1

TABLE III.

SHOWING THE AMOUNT OF RAINFALL ON THE WATERSHED OF BOTH PONDS, EXCLUSIVE OF THE WATER SURFACES, AMOUNT OF WATER DRAWN FROM THE PONDS, AMOUNT WASTED, AMOUNT RECEIVED INTO THE PONDS, AND PERCENTAGE OF THE RAINFALL AVAILABLE FOR USE, FROM 1874 TO 1886, BOTH INCLUSIVE.

Date.	Rainfall.	Amount of rainfall on the watershed of the ponds.	Amount of water drawn from the ponds for consumption.	Amount of water wasted from the ponds.	STORAGE.		Total amount of the rainfall received into the ponds.	Daily average.	Percentage of the rainfall received into the ponds.	Amount drawn from tubular wells, and from new supply.
					Increase.	Decrease.				
Year.	Inches.	Gallons.	Gallons.	Gallons.	Gallons.	Gallons.	Gallons.	Gallons.	Per cent.	Gallons.
1874 . .	34.92	837,154,949	485,189,801	21,200,000		47,545,394	458,844,407	1,257,108	54.81	
1875 . .	41.85	1,003,305,644	471,387,757	11,609,267	60,281,293		543,278,317	1,488,433	54.24	
1876 . .	45.05	1,080,099,392	395,084,629	20,500,000	74,452,111		490,036,740	1,342,566	45.37	
1877 . .	45.65	1,094,484,734	402,161,193	131,277,511	60,846,704		594,285,408	1,628,179	54.29	
1878 . .	57.36	1,379,911,034	417,678,296	205,081,247	64,712,199		687,471,742	1,883,484	49.82	
1879 . .	41.04	983,957,360	456,219,019	164,095,022		203,370,014	417,044,027	1,142,586	42 38	
1880 . .	37.28	893,809,219	401,905,570			49,803,426	352,102,144	964,663	39.38	50,069,938 T. W.
1881 . .	46.31	1,110,771,709	439,992,684	42,355,919	138,262,844		620,611,447	1,700,305	55.87	27,093,350 T. W.
1882 . .	36.39	872,470,956	551,428,907	16,792,968		92,189,985	476,031,890	1,304,197	54.55	
1883 . .	30.14	722,623,655	424,426,586	61,461,602		113,600,091	372,288,097	1,019,967	51.51	144,233,861 T. W.
1884 . .	47.75	1,144,833,429	541,225,365	104,208,215	53,996,958		699,430,538	1,911,012	61.09	74,426,562 T. W. 20,852,455 N. S.
1885 . .	45.01	1,079,140,370	291,234,263	43,286,356	196,294,799		530,815,418	1,454,289	49.19	409,430,001 N. S.
1886 . .	48.26	1,154,423,833	529,088,399	62,524,868		129,350,700	462,262,567	1,266,473	40.04	6,847,858 T. W. 237,674,057 N. S.

TABLE IV.

SHOWING THE DEPTH OF WATER IN THE PONDS FOR EACH WEEK DURING THE YEAR.

Date.	Breed's Pond.		Birch Pond.		Date.	Breed's Pond.		Birch Pond.		Date.	Breed's Pond.		Birch Pond.	
	Feet.	In.	Feet.	In.		Feet.	In.	Feet.	In.		Feet.	In.	Feet.	In.
Jan. 2	17	9½	12	0½	May 1	20	10	17	4	Sept. 4	18	5	6	3
" 9	17	10	12	8	" 8	20	9	17	2	" 11	17	6½	6	3
" 16	17	3	13	1	" 15	20	8	17	0½	" 18	16	9½	6	0½
" 23	17	1½	13	6½	" 22	20	11	16	10	" 25	16	0	6	1½
" 30	17	5½	14	2	" 29	20	10½	16	7	Oct. 2	15	3½	6	1½
Feb. 6	17	8½	14	6	June 5	20	10½	16	3	" 9	14	6	6	0½
" 13	20	5	16	3	" 12	20	9	15	10	" 16	13	8	6	0
" 20	20	2	17	4½	" 19	20	8½	14	9½	" 23	12	10	5	11
" 27	20	1½	17	4½	" 26	20	7½	13	10	" 30	12	2	6	0½
March 6	20	0	17	1	July 3	20	6	12	9½	Nov. 6	11	10½	6	4½
" 13	19	11	16	9½	" 10	20	4½	11	10½	" 13	12	1	6	3½
" 20	19	11½	16	9½	" 17	20	4½	10	11½	" 20	11	10	6	11
" 27	20	9	17	3	" 24	20	3	9	11	" 27	11	6	7	6
April 3	20	11½	17	6	" 31	20	4½	9	2	Dec. 4	11	0	8	0½
" 10	21	0	17	11	Aug. 7	20	4	8	4½	" 11	10	6½	8	3
" 17	21	1	17	11	" 14	20	3	7	6½	" 18	10	7	8	6
" 24	21	1	17	7½	" 21	20	1½	6	6	" 25	12	0	9	4
					" 28	19	4	6	3½	" 31	12	11½	9	9

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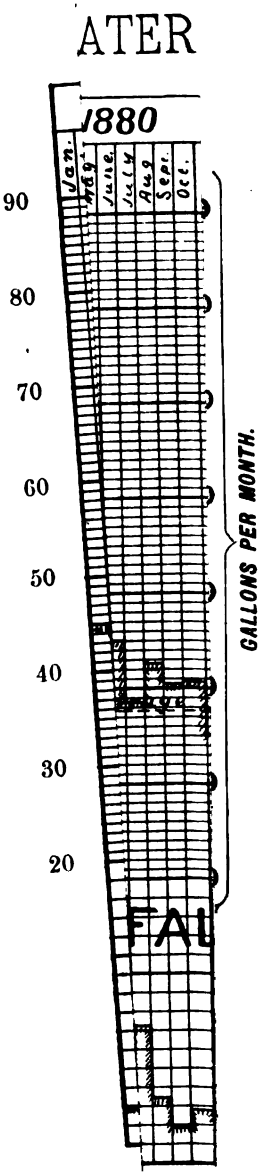
ATER
1880
Jan.
May
June
July
Aug
Sept.
Oct.
90
80
70
60
50
40
30
20
GALLONS PER MONTH.
FAL

TABLE V.

SHOWING THE RAINFALL AT THE PUMPING STATION FOR THE YEAR 1886.

Day of the Month.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1	.....	.....	.....	.....	.....	.....	.....	0.82	.....	.....	.....	0.06
2	0.03	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
3	.....	.....	.....	0.07	.....	0.69	.....	.....	.....	.....	.....	.....
4	0.40	.....	.....	.....	0.03	.....	.....	.....	.....	.....	.....	.....
5	0.43	0.06	.....	0.13	0.25	.....	.....	0.46	.....	.....	.....	0.88
6	.....	.....	.....	1.48	.....	.....	.....	.....	.....	.....	0.80	0.06
7	.....	.....	.....	.....	0.29	.....	.....	1.12	.....	.....	.....	0.64
8	0.45	.....	0.13	.....	1.11	.....	.....	.....	.....	.....	.....	.....
9	0.23	.....	.....	.....	.....	0.05	.....	.....	0.44	.....	.....	.....
10	.....	.....	.....	.....	0.16	.....	0.02	.....	0.01	.....	0.16	.....
11	.....	2.26	.....	.....	0.04	.....	.....	.....	.....	.....	.....	.....
12	.....	3.37	0.03	.....	.....	.....	.....	0.03	0.37	0.04	0.92	0.15
13	.....	0.06	0.25	0.22	0.01	0.35	.....	.....	.....	.....	0.25	.....
14	.....	.....	.....	.....	.....	0.08	0.72	.....	.....	0.03	.....	.....
15	.....	.....	.....	.....	0.55	0.08	0.22	.....	0.02	.....	.....	0.18
16	0.03	.....	0.04	.....	0.45	0.01	0.27	0.52	0.31	.....	.....	0.28
17	.....	.....	.....	.....	.....	.....	.....	.....	0.04	0.07	0.28	.....
18	0.06	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.33	1.17
19	0.93	0.52	0.42	.....	.....	.....	.....	.....	0.01	.....	.....	.....
20	.....	.....	1.50	.....	0.07	.....	.....	.....	.....	.....	.....	.....
21	0.13	0.03	0.15	.....	.....	.....	.....	.....	.....	.....	.....	.....
22	.....	.....	0.02	.....	.....	.....	.....	.....	0.21	.....	0.05	.....
23	.....	.....	.....	.....	.....	0.06	.....	.....	1.28	.....	0.64	.....
24	0.10	.....	.....	.....	.....	0.18	.....	.....	.....	.....	.....	1.28
25	0.58	0.92	.....	.....	0.22	0.07	.....	.....	.....	.....	0.40	.....
26	.....	0.25	.....	.....	.....	.....	2.56	.....	.....	0.30	.....	.....
27	0.53	.....	0.33	.....	0.08	.....	0.03	.....	0.45	0.67	.....	0.02
28	1.20	.....	.....	.....	.....	.....	.....	.....	0.08	0.28	.....	.....
29	0.40	.....	0.49	.....	.....	.....	0.21	.....	.....	0.25	.....	0.06
30	0.46	.....	0.27	.....	0.04	.....	0.02	0.07	.....	2.05	0.13	0.07
31	0.02	.....	0.07	.....	.....	.....	.....	0.57	.....	0.08	.....	0.90
	5.98	7.47	3.70	1.90	3.30	1.57	4.05	3.59	3.22	3.77	3.96	5.75

Rainfall for the year, 48.26 inches.

TABLE VI.

SHOWING THE AMOUNT AND SIZE OF PIPE LAID IN 1886.

STREETS WHERE LAID.				SIZE OF PIPE.	
Street.	From.	To.	Kind of Pipe.	4-inch.	6-inch.
Alley	Shepard . .	–	Cast Iron	68.0	–
Bloomfield . .	Fayette . .	Chatham . .	"	–	738.7
Bessie . . .	Silsbee ave. .	–	"	–	678.2
Boynton . .	Hudson . .	–	"	163.0	–
Carlton . . .	Hawthorne .	–	"	–	122.0
Collins ave. .	Extension . .	–	"	–	428.6
Chestnut . .	Lander . . .	–	"	–	62.6
Choate . . .	Extension . .	Silsbee ave. .	"	33.5	–
Fayette . . .	Logan . . .	Extension . .	"	–	206.2
Fuller . . .	Abbott . . .	–	"	220.0	–
Hawthorne .	Bay View ave.	Carlton . .	"	–	720.0
Henry ave. . .	Extension . .	–	"	–	205.5
Lynnfield . .	"	–	"	–	1,626.7
Lake	"	Pond . . .	"	–	218.0
Ontario . . .	"	–	"	–	398.0
Rockingham .	"	–	Cement	–	79.0
Rhodes . . .	Saratoga . .	–	Cast Iron	120.5	–
Silsbee ave. .	Choate . . .	Bessie . . .	"	–	678.2
Shepard . . .	Alley . . .	–	"	–	80.0
Sheldon . . .	Eastern ave. .	–	"	212.8	–
Totals				817.8	6,241.7

SHOWING THE AMOUNT AND SIZE OF PIPE LAID IN COURTS IN 1886.

COURTS WHERE LAID.				SIZE OF PIPE.		
Court.	From.	To.	Kind.	2-inch.	1½-in.	1¼-in.
Brown's ct. . .	Boston . .	End of ct.	Lined	161.0	142.0	–
Chadwell ct., .	Summer .	"	"	–	160.2	–
Elmwood pl.. .	Johnson . .	"	"	165.6	21.8	–
Harvard pl. . .	Tudor . .	"	"	137.2	41.5	–
Leavitt pl. . .	Chatham .	"	"	185.5	60.5	–
Lee ct. . . .	"	"	"	204.0	32.0	–
Myrtle st. . .	Extension .	–	"	–	–	55.0
Ward st. . . .	Adams . .	Jefferson	"	176.5	–	–
Williams ct. . .	Extension .	End of ct.	"	–	–	72.0
Wheeler st. . .	"	"	"	–	28.0	–
Totals				1,029.8	486.0	127.0

TABLE VI.—CONTINUED.

PIPE LAID FOR HIGH SERVICE.

Street.	From.	To.	12"	8"	6"	4"	Kind.
Reservoir road	Reservoir	Linwood	752	–	–	–	–
Private way	Linwood	Holder's Pond	636	–	–	4	Cast Iron.
Tapley	Holder's Pond	Woodlawn	735	–	4	–	–
Woodlawn	Tapley	Lover's Leap av	154	–	–	–	–
Lovers' Leap av.	Woodlawn	Forest	826	–	4	–	–
Forest	Lover's Leap av	No. Franklin	254	–	–	–	–
No. Franklin	Forest	Franklin	900	–	–	–	–
Franklin	No. Franklin	Western ave.	680		– –	26 4	Cement. Cast Iron.
Western ave.	Franklin	Bay View ave.	2,540		– –	31 4	Cast Iron. Cement.
Bay View ave.	Western ave	Hollingsworth	1,688		– 27	24 2	Cement. Cast Iron.
Hollingsworth	Bay View ave.	Rockaway	436	–	–	–	–
Rockaway	Hollingsworth	Connection	–	31	–	–	–
Allen ave.	Bay View ave.	Connection	–	–	30	–	–
Totals			– 9,601	– 31	– 65	54 41	Cement. Cast Iron.

	Miles.	Feet.
Total pipe laid in 1886	3	2,654
Previously laid	75	1,002
Total to January 1, 1887	78	3,656
Total in Saugus	1	530

TABLE VII.

SHOWING THE LOCATION OF GATES SET IN 1886.

Street.	Location.	Size. Inches.
Alley	19½ ft. N. from the S. line of Alley st.; 1¼ ft. E. from the E. line of Shepard st.	4
Acorn	22 ft. E. from the W. line of Acorn st.; on the line of the S. line of Hollingsworth st.	4
Adams (High service.)	33½ ft. S. from the N. line of Adams st.; 6 in. W. from the E. line of Duke st.	6
Bloomfield	16½ ft. S. from the N. line of Bloomfield st.; 21 ft. E. from the E. line of Fayette st.	6
Bloomfield	16 ft. S. from the N. line of Bloomfield st.; on the line of the W. line of Chatham st.	6
Bessie	36 ft. E. from the W. line of Bessie st.; 1 ft. N. from the N. line of Silsbee ave.	6
Boynton	15 ft. W. from the E. line of Boynton st.; on the line of the S. line of Hudson st.	4
Choate	16 ft. W. from the E. line of Choate st.; 4 ft. S. from the S. line of Silsbee ave.	4
Fayette extension	16 ft. E. from the W. line of Fayette st.; on the line of the N. line of Logan st.	6
Fuller	16 ft. S. from the N. line of Fuller st.; 1 ft. E. from the W. line of Abbott st.	4
Hawthorne	16½ ft. S. from the N. line of Hawthorne st.; on the line of the E. line of Bay View ave.	6
Hawthorne	17 ft. S. from the N. line of Hawthorne st.; 2 ft. W. from the W. line of Carlton st.	6
Henry ave. ext.	32 ft. N. from the S. line of Henry ave.; on the line of the E. line of Henry ave.	6
Henry ave. (High service.)	38¾ ft. W. from the E. line of Henry ave.; on the line of the N. line of Allen ave.	6
Highland ave. (High service.)	9¼ ft. W. from the E. line of Highland ave.; 15¼ ft. N. from the N. line of house No. 13	6
High Rock (High service.)	18 ft. S. from the N. line of High Rock st.; on the line of the W. line of Herbert st.	6
Hollingsworth (High service.)	13 ft. S. from the N. line of Hollingsworth st.; 6 in. E. from the W. line of Bay View ave.	6
Jefferson (High service.)	10¾ ft. N. from the S. line of Jefferson st.; 6 ft. E. from the E. line of Duke st.	6
Lake	16½ ft. N. from the S. line of Lake st.; on the line of the E. line of Pond st.	6
Lynnfield	7 ft. W. from the E. line of Lynnfield st.; 6½ ft. N. from the N. line of Bacheller st.	6

TABLE VII.—CONTINUED.

LOCATION OF GATES.—*Continued.*

Street.	Location.	Size. Inches.
Olive . . .	22 ft. N. from the S. line of Olive st.; 1 ft. W. from the W. line of Fayette st. . . .	4
Rockaway . . (High service.)	9½ ft. E. from the W. line of Rockaway st.; on the line of the S. line of Mountain ct. . .	8
Rockaway . .	18½ ft. E. from the W. line of Rockaway st.; 24 ft. N. from the S. line of Hollingsworth st. .	8
Rhodes . . .	15½ ft. W. from the E. line of Rhodes st.; on the line of the N. line of Saratoga st. . .	4
Sheldon . .	16 ft. S. from the N. line of Sheldon st.; 1 ft. W. from the W. line of Eastern ave. . .	4
Shepard . .	12½ ft. W. from the E. line of Shepard st.; 2 ft. N. from the N. line of Alley st. . . .	6

SHOWING THE LOCATION OF GATES SET IN COURTS IN 1886.

Court.	Location.	Size. Inches.
Brown's ct. .	6 ft. W. from the E. line of Brown's ct.; on the line of the S. line of Boston st. . . .	2
Chadwell ct. .	5 ft. E. from the W. line of Chadwell ct.; 2 ft. N. from the N. line of Summer st. . . .	1½
Elmwood pl. .	5 ft. N. from the S. line of Elmwood pl.; on the line of the W. line of Johnson st. . .	2
Harvard pl. .	7½ ft. W. from the W. gate-post to Harvard pl.,; 6½ ft. S. from the N. line of Tudor st. .	2
Leavitt pl. .	17 ft. S. from the N. line of Leavitt pl.; 6 ft. W. from the E. line of Chatham st.	2
Lee ct. . .	8½ ft. S. from the N. line of Lee ct.; on the line of the E. line of Chatham st. . . .	2
Ward st. . .	7½ ft. E. from the W. line of Ward st.; on the on the line of the N. line of Adams st. . .	2

TABLE VII.—CONTINUED.

GATES AND BLOW-OFFS ON HIGH SERVICE.

Street.	Location.	Size. Inches.
Reservoir . .	80 ft. N. from the steps to a 2-inch. pipe driven in top of dam; 26½ ft. E. from 2-in. pipe at top of the dam.	12
Holder's dam .	11½ ft. S. from stone set in the dam; 9 ft. E. from center of outlet to pond	12
Holder's dam .	15¾ ft. W. and 2½ ft. S. from 12 in. gate . .	Blow-off. 4
Holder's dam .	3 ft. E. and 2½ ft. S. from 12 in. gate . .	Blow-off. 4
Lover's Leap ave.	15 ft. E. from the W. line of Lover's Leap ave.; 54½ ft. S. from the N. end of stone wall.	12
No. Franklin .	3½ ft. W. from the E. line of No. Franklin st.; 52¼ ft. S. from the N. line of Boston st. . .	Blow-off. 4
No. Franklin .	On the line of the E. line of No. Franklin st.; 54¾ ft. S. from the N. line of Boston st. . .	12
Franklin . .	16¼ ft. W. from the E. line of Franklin st.; 10 ft. N. from the N. line of Western ave. . .	Blow-off 4
Western ave. .	23 ft. N. from the S. line of Western ave.; 17¾ ft. E. from the W. line of Washington st. . .	12
Western ave. .	20½ ft. N. from the S. line of Western ave.; 19 ft. W. from the E. line of Washington st. .	Blow-off. 4
Western ave. .	43¾ ft. S. from the N. line of Western ave.; 69¼ ft. E. from the E. line of house No. 281 . .	12
Western ave. .	36¼ ft. S. from the N. line of Western ave.; 72 ft. E. from the E. line of house No. 281 . .	Blow-off. 4
Bay View ave. .	25 ft. W. from the E. line of Bay View ave.; 2 ft N. from the N. line of Grant st. . . .	12
Bay View ave. .	29¼ ft. E. from the W. line of Bay View ave.; 65 ft. S. from the N. line of Hamilton ave.;	Blow-off. 4
Washington .	Gate connecting the High Service with the 12 in. pipe on Washington st.	12
Washington .	10 ft. E. from the W. line of Washington st.; 16½ ft. N. from the S. line of Western ave.;	12
Reservoir . .	96½ ft. E. from the 12 in. gate at reservoir to a Y pipe	12

Number of gates set in 1886	48
Number previously set	610
Total gates set to January 1, 1887	658

TABLE VIII.

SHOWING THE LOCATION OF HYDRANTS SET IN 1886.

STREET.	LOCATION.
Bay View avenue	opposite Beacon Hill avenue.
Bay View avenue	100 ft. north from Grant street.
Bloomfield street	290 ft. from Fayette street.
Bessie street	123 ft. north from Silsbee avenue.
Bessie street	527 ft. north from Silsbee avenue.
Carlton street	120 ft. north from Hawthorne street.
Collins avenue	450 ft. southerly from Boston street.
Fuller street	200 feet east from Boston street.
Hawthorne street	330 ft. east from Bay View avenue.
Lynnfield street	6 ft. southerly from Bacheller street.
Lynnfield street	450 ft. north from Bacheller street.
Lynnfield street	900 ft. north from Bacheller street.
Lynnfield street	1,300 ft. north from Bacheller street.
Ontario street	450 ft. east from Tapley street.
Silsbee avenue	7 ft. east from Choate street.

Number of hydrants set in 1886	15
Hydrants previously set	557
Total number set to December 31, 1886	572

TABLE IX.

SHOWING THE NUMBER, SIZE AND LENGTH OF SERVICES LAID IN 1886.

MONTH.	SIZE AND LENGTH OF PIPE.												Total.	
	4-inch.		2-inch.		1½-inch.		1¼-inch.		1-inch.		¾-inch.			
	No.	Feet.	No.	Feet.	No.	Feet.	No.	Feet.	No.	Feet.	No.	Feet.	No.	Feet.
January	–	–	–	–	–	–	–	–	–	–	4	107.5	4	107.5
February	–	–	–	–	–	–	–	–	–	–	–	–	–	–
March	–	–	1	19.6	–	–	1	30.6	7	353.2	15	521.3	24	924.5
April	–	–	1	60.	–	–	1	82.	18	839.8	40	1,664.	60	2,645.8
May	1	39.2	5	42.6	–	–	2	57.6	8	713.1	26	1,242.6	42	2,094.9
June	–	–	–	–	2	143.10	1	72.	6	412.4	32	1.435.2	41	2,063.4
July	1	26.	1	23.6	–	–	2	178.8	13	510.2	44	1,799.11	61	2,538.3
August	1	20.	–	–	1	36.	–	–	9	508.6	42	1,567.	53	2,131.6
September	3	65.	–	–	–	–	1	40.	5	605.11	36	1 577.5	45	2,288.4
October	–	–	–	–	2	204.5	2	270.	11	788.1	36	1,682.00	51	2,944.6
November	–	–	–	–	–	–	1	63.6	18	1,318.7	44	1 713.5	63	3,095.6
December	–	–	–	–	–	–	–	–	1	29.4	10	294.5	11	323.9
Totals	6	150.2	8	145.6	5	384.3	11	794.2	96	6,078.10	329	13,604.6	455	21,157.5

TABLE X.

REPAIRS OF PIPES, HYDRANTS AND GATES IN 1886.

MONTH.	SIZE OF PIPE.							SIZE OF GATE.		Hydrants.
	10	8	6	4	1½	1	¾	8	6	
January	1	1	–	2	–	2	2	–	–	1
February	–	–	2	2	–	2	–	–	–	1
March	1	1	1	–	–	1	1	–	–	3
April	–	–	3	4	–	–	1	–	–	–
May.	–	1	–	1	–	–	–	–	–	–
June	1	–	4	–	–	–	–	–	–	–
July	–	–	4	7	–	–	3	–	–	–
August.	–	1	3	6	–	–	1	–	–	–
September	3	3	8	5	–	–	–	–	–	–
October	2	1	12	3	–	–	–	–	–	1
November	–	1	9	4	–	–	–	1	1	3
December.	–	1	6	3	1	1	1	–	–	3
Totals	8	10	52	37	1	6	9	1	1	12

Meteorological Record for January, 1886.

	8 A. M.		1 P. M.		6 P. M.		24 HOURS ENDING 8 A. M.				
Date.	Barometer.	Thermometer.	Barometer.	Thermometer.	Barometer.	Thermometer.	Maximum Thermometer.	Minimum Thermometer.	Daily range.	Daily mean.	Rainfall.
1	29 91	40.5°	29.95	47°	29.99	41.5°	47°	32.5°	14.5°	39.7°	-
2	30.23	32.5	30 25	43	30.29	41	42 5	34.5	8	38.5	.02
3	30.35	39.5	30.35	41.5	30.35	38.5	42.5	39	3.5	40.7	-
4	30.36	42.5	30.34	43	30.30	43	44	42.5	1.5	43.2	.31
5	30.04	44	29.89	45.5	29.78	45	49	32	17	40.5	.43
6	29.69	32	29.67	39.5	29.67	32	40	17	23	28.5	-
7	29.66	17.5	29.67	22	29.69	20	24	9.5	14.5	16.7	-
8	29.77	12	29.79	24	29.82	22	27	13.5	13.5	20.2	*s* .20
9	29.78	22.5	29.73	30	29.71	18.5	31.5	9.5	22	20.5	*s* .13
10	29.67	11.5	29.67	16	29.67	12	17	6	11	11.5	-
11	29.69	8	29.72	16	29.75	12	17.5	-9	26.5	4.2	-
12	29.85	-9	29.90	-0.5	29.97	1	4	-9	13	-2.5	-
13	30.17	1	30.22	12	30.25	12.5	20.5	-1	21.5	9.7	-
14	30.39	5 5	30.42	22.5	30.44	19 5	25	5	20	15	-
15	30.50	10	30.50	30.5	30.50	26	32	11	21	21.5	-
16	30.49	17	30.48	33	30.44	34	35	17.5	17.5	26.2	.02
17	30.20	32	30.18	40.5	30.16	31.5	40	24	16	32	-
18	30.13	24	30.14	28	30.15	27	30	22	8	26	-
19	30.23	22	30.22	36	30.17	40	42	22	20	32	.82
20	30.13	26.5	30.21	32.5	30.25	29	34	25.5	8 5	29.7	-
21	30.33	34	30.31	38	30.26	38.5	40	31	9	35.5	.06
22	30.17	33.5	30.15	35	30.11	34	37	27	10	32	.01
23	30.05	27	30.09	24 5	30.13	19.5	27.5	1	26.5	14.2	-
24	30.25	2.5	30.26	8	30.27	7	10	3	7	6.5	*s* .07
25	30.29	10	30.30	17.5	30.30	19.5	33.5	9	24.5	21.2	*s* .54
26	30.25	27.5	30.25	36	30.24	38	40.5	29	11.5	34.7	-
27	30.26	32	30.27	27	30.26	30	34	27	7	30.5	.68
28	30.21	32.5	30.14	34	30.09	33.5	34	28.5	5.5	31.2	.90
29	29.96	30.5	29.93	32.5	29.90	33	36	30	6	33	.37
30	29.83	34.5	29.79	39.5	29.75	34.5	41.5	21.5	20	31.5	*s* .31
31	29.73	22.5	29.76	29.5	29.78	29	33	23.5	9.5	28.2	*s* .02
Monthly range									58°		
Monthly mean										25.6°	
Monthly rainfall											4.89

Meteorological Record for February, 1886.

	8 A. M.		1 P. M.		6 P. M.		24 HOURS ENDING 8 A. M.				
Date.	Barometer.	Thermometer.	Barometer.	Thermometer.	Barometer.	Thermometer.	Maximum Thermometer.	Minimum Thermometer.	Daily range.	Daily mean.	Rainfall.
1	29.80	24°	29.84	31.5°	29.86	22°	32.5°	9.5°	23°	21°	–
2	29.90	9.5	29.93	20.5	29.95	24	25.5	9.5	16	17.5	–
3	30.03	10	30.08	17	30.10	16	20	2	18	11	s .05
4	30.11	2	30.10	5	30.10	7.5	9.5	6	3.5	7.7	–
5	30.10	5.5	30.10	1.5	30.12	0	5	5.5	–0.5	–0.25	–
6	30.13	0	30.13	16	30.13	18	21	1.5	19.5	11.2	–
7	30.14	18.5	30.23	29	30.13	28	31	19	12	25	–
8	30.11	26.5	30.10	37.5	30.07	37	39.5	27.5	12	33.5	–
9	30.05	32	30.07	47.5	30.09	40	50	27.5	22.5	38.7	.01
10	30.20	34.5	30.32	41	30.40	37	41	34	7	37.5	–
11	30.52	35.5	30.54	35.5	30.54	35	37.5	34.5	3	36	2.09
12	30.50	37.5	30.41	43.5	30.29	43.5	49	38	11	43.5	3.10
13	29.98	48	29.82	50	29.75	45.5	51	38.5	12.5	44.7	.04
14	29.78	39.5	29.82	49	29.84	44.5	51	39	12	45	–
15	29.93	38	29.96	45.5	29.94	47.5	61.5	31.5	20	41.5	–
16	29.90	32	29.94	35	29.98	26.5	35.5	19	16.5	27.2	–
17	30.10	20	30.15	27.5	30.15	25.5	29.5	20.5	9	25	–
18	30.14	29	30.14	40.5	30.14	37	41.5	30	11.5	35.7	–
19	30.15	33.5	30.11	45.5	30.06	38.5	46	35.5	10.5	40.7	.48
20	29.88	45.5	29.85	35.5	29.83	21.5	42	8.5	33.5	25.2	–
21	29.84	11	29.85	23.5	29.87	23.5	27.5	13	14.5	20.2	s .01
22	29.93	18	29.86	26	29.99	26.5	37	19	18	28	–
23	29.99	35	29.97	41.5	29.98	34	42	12	30	27	–
24	30.04	12.5	30.10	18	30.25	18	26	12.5	13.5	19.2	–
25	30.19	21	30.17	29	30.12	35	44	27	17	35.5	.77
26	29.84	29.5	29.80	19	29.78	11	29.5	4	25.5	16.7	.14
27	29.77	4.5	29.77	8.5	29.77	8.5	12	4.5	7.5	8.2	–
28	29.78	7.5	29.77	21	29.77	16	23.5	–0.5	24.0	9.2	–
Monthly range									56.5°		
Monthly mean										26.34°	
Monthly rainfall											6.69

Meteorological Record for March, 1886.

	8 A. M.		1 P. M.		6 P. M.		24 HOURS ENDING 8 A. M.				
Date.	Barometer.	Thermometer.	Barometer.	Thermometer.	Barometer.	Thermometer.	Maximum Thermometer.	Minimum Thermometer.	Daily range.	Daily mean.	Rainfall.
1	29.79	−0.5°	29.79	8°	29.79	7°	10°	0°	10°	5°	–
2	29.77	7 5	29.77	18	29.76	16	21	7.5	13.5	14.2	–
3	29.76	19	29.76	29.5	29.77	28	31.5	7.5	24	19.5	–
4	29.79	25.5	29.81	38	29.82	34	39	26	13	32.5	–
5	29.85	28.5	29.85	36	29.85	33	37.5	29	8.5	33.2	–
6	29.85	30.5	29.85	35	29.85	31	36.5	21	15.5	28.7	–
7	29.87	22	29.87	29	29 88	29	31.5	22	9.5	26.7	–
8	29.88	27.7	29.89	36	29.88	36	37.5	27.5	10	32.5	*s* .10
9	29.85	27.5	29.86	21.5	29.87	22.5	27.5	16.5	11	22	–
10	29.91	21	29.92	33	29.92	30	33.5	21	12.5	27.2	–
11	29.93	27	29.93	40	29.93	40	44	28	16	36	–
12	29.91	38	29.88	45	29.85	38	45.5	37	8.5	41.2	.02
13	29.75	37	29.70	43.5	29.68	37.5	46	26.5	19.5	36.2	.21
14	29.65	28.5	29.68	39	29.79	38.5	41.5	29	12.5	35.2	–
15	29.95	34	29.99	38	30.01	36	40	34.5	5.5	37.2	–
16	29.99	36	29.95	41.5	29.95	34.5	44.5	28.5	16	36.5	–
17	30.03	31.5	30.07	36.5	30.11	33.5	37.5	31	6.5	34.2	–
18	30.14	36	30.14	48	30.14	42.5	48	27	21	37.5	–
19	30.14	32	30.15	35.5	30.14	33.5	37.5	35.5	2	36.5	*s* .33
20	30.12	35	30.09	36	30.06	36	37	35	2	36	1.29
21	29.98	36.5	29.92	39	29.87	34.5	38.5	32	6.5	35.2	.11
22	29.78	35.5	29.74	47.5	29.71	42	46.5	34	12.5	40.2	–
23	29.64	37	29.64	41	29.64	36	41.5	22.5	19	32	–
24	29.65	25	29.71	33	29.76	32	36.5	25.5	11	31	–
25	30 01	35.5	30.03	41.5	30.05	43.5	45.5	36	9.5	40.7	–
26	29.96	46	29.96	51	29 96	47.5	51.5	38	13.5	44.7	–
27	30.02	41.5	30.07	51	30.11	44	51.5	34	17.5	42.7	.28
28	30.16	36	30.20	40.5	30.22	36.5	42	31	11	36.5	–
29	30.31	36.5	30.36	40	30.37	36	41	36.5	4.5	38.7	.44
30	30.28	37	30.25	42.5	30.22	37.5	44.5	37	7.5	40.7	.21
31	30.18	44.5	30.15	60.5	30.08	58	61.5	45	16.5	53.2	.06

Monthly range	61.5°		
Monthly mean		33.69°	
Monthly rainfall			3.05

Meteorological Record for April, 1886.

	8 A. M.		1 P. M.		6 P. M.		24 HOURS ENDING 8 A. M.				
Date.	Barometer.	Thermometer.	Barometer.	Thermometer.	Barometer.	Thermometer.	Maximum Thermometer.	Minimum Thermometer.	Daily range.	Daily mean.	Rainfall.
1	29.86	50.5°	29.87	54°	29.86	48°	54°	38.5°	15.5°	46.2°	–
2	29.94	45	29.94	55	29.55	44	55	35.5	19.5	45.2	–
3	30.02	35.5	30.04	36	30.06	36.5	41	27.5	13.5	34.2	–
4	30.12	32	30.12	34.5	30.13	33.5	36.5	31	5.5	33.7	–
5	30.17	36.5	30.10	40	30.20	37	42.5	35.5	7	39	.10
6	30.18	35.5	30.13	35	30.05	37.5	42.5	35	7.5	38.7	1.49
7	29.89	40	29.89	37.5	29.89	35	40.5	32	8.5	36.2	–
8	29.93	33	29.97	40	29.99	37.5	42.5	31	11.5	36.7	–
9	30.02	35.5	30.05	53	30.07	58	62	36.5	25.5	49.2	–
10	30.09	52.5	30.09	64	30.10	50	64	33.5	30.5	48.7	–
11	30.22	38.5	30.30	37	30.35	36.5	42	35.5	6.5	38.7	–
12	30.43	42	30.45	51	30.44	52	57	43	14	50	–
13	30.37	55.5	30.32	61.5	30.24	58.5	63	43	20	53	.23
14	30.27	50	30.31	53	30.31	48	54	43	11	48.5	–
15	30.33	46.5	30.33	53.5	30.34	47	51.5	38.5	13	45	–
16	30.43	39.5	30.48	45.5	30.50	41	46	38	8	42	–
17	30.53	43	30.54	51	30.54	46	52	41	11	46.5	–
18	30.52	53	30.51	66.5	30.48	61.5	66.5	51	15.5	58.7	–
19	30.39	66.5	30.37	68	30.33	60.5	69.5	52.5	17	61	–
20	30.34	56	30.36	51.5	30.35	46	59	43 5	15.5	51.2	–
21	30.30	58.5	30.23	71.5	30.17	61	71.5	34.5	37	53	–
22	30.13	58	30.14	58	30.12	55	61	46	15	53.5	–
23	30.09	59	30.00	76.5	29.92	68	78	58	20	68	–
24	29.83	69	29.86	63.5	29.89	52.5	69	43.5	25.5	56.2	–
25	30.02	46.5	30.04	46.5	30.05	47.5	52	45.5	6.5	48.7	–
26	30.03	52.5	30.02	54	29.98	64	64.5	41	23.5	52.7	–
27	30.01	48	30.01	48	30.00	48	50	46	4	48	–
28	29.98	48	29.97	56	29.96	48	57.5	46	11.5	51.7	–
29	29.98	46	30.00	51	30.00	49.5	52	42	10	47	–
30	30.02	47.5	30.04	51	30.05	47	51	39.5	11.5	45.2	–
Monthly range									50.5°		
Monthly mean										47.57°	
Monthly rainfall											1.82

Meteorological Record for May, 1886.

	8 A. M.		1 P. M.		6 P. M.		24 HOURS ENDING 8 A. M.				
Date.	Barometer.	Thermometer.	Barometer.	Thermometer.	Barometer.	Thermometer.	Maximum Thermometer.	Minimum Thermometer.	Daily range.	Daily mean.	Rainfall.
1	30.05	49.5°	30.05	52°	30.03	49°	53.5°	40.5°	13°	47°	–
2	30.03	47	30.03	46.5	30.03	43.5	48	36.5	11.5	42.2	–
3	30.04	47.5	30.06	49	30.06	56	59.5	47.5	12	53.5	–
4	30.06	55	30.04	72	30.01	64	74	47.5	26.5	60 7	.03
5	29.95	58	29.91	73	29.86	65	75	49.5	25.5	62.2	.24
6	29.91	54	29.92	64	29 92	59	66	46	20	56	–
7	29.96	59.5	29.98	60	29.98	61	63	48	15	55.5	.21
8	29.98	49	29.88	49	29.81	46.5	51	46.5	4.5	48.7	1.32
9	29.76	51	29.76	64	29.78	63.5	65.5	47	18.5	56.2	–
10	29.96	55	30.03	58	30.03	57.5	58	47	11	52.5	.14
11	30.09	47	30.10	45	30.10	44.5	47	44	3	45.5	.04
12	30.09	45.5	30.09	49	30.08	47	50	42	8	46	.01
13	30.05	43.5	30.05	48	30.04	45.5	49.5	44	5.5	46.7	.02
14	30.05	49.5	30.07	53.5	30.09	46.5	54	43	11	48.5	–
15	30.08	44	30.08	49.5	30.05	48.5	57	44	13	50.5	.45
16	29.90	57	29.88	63.5	29.87	57.5	52.5	43	9.5	47.7	.42
17	30.05	52.5	30.06	58.5	30.05	58.5	59	42.5	16.5	50.7	–
18	30.22	55.5	30.25	58.5	30.26	59	61	50.5	10.5	55.7	–
19	30.27	57.5	30.26	64.5	30.21	65	66	50.5	15.5	58.2	–
20	30.12	61.5	30.00	72.5	29.90	66	73	52	21	62.5	.10
21	29.91	58.5	29.92	66	29.92	67	68	49	19	58.5	–
22	29.55	64	29.92	70	29.87	67	72	51	21	61.5	.01
23	29.85	68.5	29.83	74.5	29.81	71.5	75	56.5	18.5	65.7	–
24	29.84	61	29.82	64	29.80	58	67	53	14	60	–
25	29.68	63	29.60	55	29.57	53	62	44	18	53	.25
26	29.59	49	29.60	54	29.62	52.5	56.5	48.5	8	52.5	–
27	29.68	56.5	29.69	63.5	29.69	52.5	65	51	14	58	.13
28	29.71	56	29.76	59	29.79	58	64	48.5	15.5	56.2	–
29	29.88	62	29.92	65	29.90	61.5	67	57	10	62.	–
30	29.90	67.5	29.88	77.5	29.84	73.5	80.5	60	20.5	70.2	.04
31	29.91	61.5	29.95	63.5	29.98	64.5	67	52	15	59 5	–
Monthly range									44°		
Monthly mean										54.98°	
Monthly rainfall											3.41

Meteorological Record for June, 1886.

	8 A. M.		1 P. M.		6 P. M.		24 HOURS ENDING 8 A. M.				
Date.	Barometer.	Thermometer.	Barometer.	Thermometer.	Barometer.	Thermometer.	Maximum Thermometer.	Minimum Thermometer.	Daily range.	Daily mean.	Rainfall.
1	30.06	62°	30.09	64.5°	30.10	62.5°	66.5°	52°	14.5°	59.2°	–
2	30.12	62	30.10	70.5	30.05	66.5	72	61.5	10.5	66.7	–
3	29.89	65	29.84	70	29.85	65.5	69	49.5	19.5	59.2	.60
4	30.03	60	30.07	64	30.08	63	63.5	51	12.5	57.2	–
5	30.10	61.5	30.10	62	30.10	63	74	47.5	26.5	60.7	–
6	30.12	58	30.12	65.5	30.13	68.5	68	54.5	13.5	61.2	–
7	30.17	63	30.18	68.5	30.13	63	68.5	58.5	10	63.5	–
8	30.03	60	30.03	72.5	30.04	73	74	55	19	64.5	–
9	30.07	66	30.04	70.5	29.90	73.5	76	57	19	66.5	.04
10	29.82	62.5	29.76	71	29.73	70	72	58	14	65	–
11	29.85	70.5	29.90	66.5	29.93	57.5	70	53	17	61.5	–
12	30.06	56	30.13	63	30.15	57	62	53	9	57.5	–
13	30.19	56	30.18	55	30.15	53.5	56	52	4	54	.31
14	30.13	55.5	30.13	56	30.13	55	56.5	54	2.5	55.2	.19
15	30.10	55.5	30.10	58	30.07	57.5	63	53	10	58	.03
16	29.99	61.5	29.93	66	29.84	68	72	62.5	9.5	67.2	–
17	29.75	72.5	29.65	71	29.54	69.5	76.5	65.5	11	71	.01
18	29.61	68	29.70	69.5	29.76	65	72	48.5	23.5	60.2	–
19	29.97	58	30.02	61.5	30.06	61	64	48	16	56	–
20	30.16	63.5	30.18	66	30.20	69	68.5	54.5	14	61.5	–
21	30.26	68.5	30.29	76	30.28	71	76.5	57.5	19	67	–
22	30.23	70	30.18	80.5	30.14	74	79	63.5	15.5	71.2	–
23	30.16	70.5	30.04	64.5	30.03	61	70.5	57.5	13	64	.07
24	30.01	58.5	30 02	60	30.02	59	61	57.5	3.5	59.2	.14
25	29.97	60.5	29.94	63.5	29.90	63.5	67	59	8	63	.04
26	29.81	67.5	29.75	77	29.72	74	76.5	61.5	15	69	–
27	29.75	71	29.77	74	29.82	71.5	74	55	19	64.5	.01
28	29.99	58.5	30.03	62	30.04	64.5	67.5	55	12.5	61.2	–
29	30.02	67.5	29.93	77	29.87	78	78.5	54	24.5	66.2	–
30	30.06	65	30.08	68.5	30.10	70.5	72	53	19	62.5	–
Monthly range									31.5°		
Monthly mean										62 47°	
Monthly rainfall											1.44

Meteorological Record for July, 1886.

	8 A. M.		1 P. M.		6 P. M.		24 HOURS ENDING 8 A. M.				
Date.	Barometer.	Thermometer.	Barometer.	Thermometer.	Barometer.	Thermometer.	Maximum Thermometer.	Minimum Thermometer.	Daily range.	Daily mean.	Rainfall.
1	30.18	67°	30.19	75.5°	30.19	75.5°	77°	53°	24°	65°	–
2	30.19	66.5	30.17	79.5	30.12	75.5	80	61	19	70.5	–
3	30.06	75.5	30.07	82	30.06	74	81.5	60	21.5	70.7	–
4	30.17	65	30.18	72	30.19	70.5	72.5	63.5	9	68	–
5	30.20	73	30.22	74.5	30.21	67.5	77	62	15	69.5	–
6	30.17	74	30.11	88	30.07	87	92	72.5	19.5	82.2	–
7	29.89	81	29.83	89	29.80	90	92	70	22	81	–
8	29.97	76	30.01	77	30.01	72	79	58.5	20.5	68.7	–
9	30.11	68	30.12	71	30.12	68	71	57.5	13.5	64.2	–
10	30.03	64.5	29.97	67	29.94	65	70.5	58	12.5	64.2	.03
11	29.87	71	29.85	79.5	29.84	78.5	81	51.5	29.5	66.2	–
12	29.92	62	29.92	72	29.92	73	75	55	20	65	–
13	30.00	68	30.03	71	30.03	74	75	59.5	15.5	67.2	–
14	30.11	66	30.13	67.5	30.12	63	68.5	62.5	6	65.5	.61
15	30.11	63.5	30.00	68	29.97	73	75	63.5	11.5	69.2	.45
16	29.99	72	29 98	73.5	29.96	71.5	76.5	66.5	10	71.5	.21
17	29.97	73	29.96	76	29.95	75	78.5	66	12.5	72.2	–
18	30.02	72.5	29.99	74.5	29.97	74	78	64	14	71	–
19	29.87	72	29.84	75	29.80	75.5	78	60	18	69	–
20	29.80	67.5	29 79	76	29.78	73.5	76	59	17	67.5	–
21	29.86	68.5	29.87	71.5	29.86	68.5	72	57.5	14.5	64.7	–
22	29.84	67	29 85	77	29.87	75.5	77 5	55.5	22	66.5	–
23	30.04	64.5	30.06	69	30.07	67.5	70	56	14	63	–
24	30.13	67	30.12	75.5	30.11	75.5	77	59	18	68	–
25	30.11	67	30.09	74	30.06	75	78	63.5	14.5	70 7	–
26	29.97	71.5	29.96	74	29.90	69.5	74.5	68.5	6	71.5	1.85
27	29.82	72	29.78	74.5	29.76	73	75	63	12	69	.06
28	29.84	69.5	29.85	74.5	29 85	72	74.5	63.5	11	69	–
29	29.92	72	29.92	78	29 89	77.5	80	63.5	16.5	71.7	.25
30	29.89	73.5	29.94	80	29.92	79	81	66.5	14.5	73.7	–
31	29.98	68	30.00	73	30.00	70.5	74	64.5	9.5	69.2	.02
Monthly range									40.5°		
Monthly mean										69.22°	
Monthly rainfall											3.48

Meteorological Record for August, 1886.

	8 A. M.		1 P. M.		6 P. M.		24 HOURS ENDING 8 A. M.				
Date.	Barometer.	Thermometer.	Barometer.	Thermometer.	Barometer.	Thermometer.	Maximum Thermometer.	Minimum Thermometer.	Daily range.	Daily mean.	Rainfall.
1	30.01	69.5°	29.98	72.5°	29.90	69°	73	64.5°	8.5°	68.7	.64
2	29.62	72	29.57	77	29.58	75.5	80	55	25	67.5	–
3	29.62	60	29.64	64.5	29.66	62	65.5	56	9.5	60.7	–
4	29.84	63.5	29.90	72.5	29.92	70.5	75	55	20	65	–
5	30.01	63.5	30.02	70	30.02	66	71.5	59.5	12	65.5	.40
6	30.06	65.5	30.07	70.5	30.07	65	70	58	12	64	–
7	30.10	65	30.09	66	30.09	60	69.5	56.5	13	63	1.05
8	30.06	62	30.11	69.5	30.15	67.5	69.5	60.5	9	65	–
9	30.30	69.5	30.33	80	30.32	78.5	82	61	21	71.5	–
10	30.31	71	30.24	78.5	30.15	78	81.5	63.5	18	72.5	–
11	29.97	71	29.90	79.5	29.82	80	81	70	11	75.5	–
12	29.77	73	29.82	82.5	29.84	75	82	61	21	71.5	.02
13	30.02	70	30.03	71.5	29 98	70.5	75	67	8	71	–
14	29.79	73	29.70	75	29.69	77	78.5	56	22.5	67.2	.12
15	29.95	60.5	29.99	69	30.00	70	71	54	17	62.5	–
16	30.07	63.5	30.08	68	30.02	67	71	59	12	65	.46
17	29.76	59	29.87	62	29.94	60	64	54	10	59	–
18	30 10	61	30.15	63	30.17	61	65.5	55.5	10	60.5	–
19	30.23	63.5	30.25	64.5	30.28	62.5	68	51.5	16.5	59.7	–
20	30.37	62	30.39	66	30.38	62	66	49	17	57.5	–
21	30.37	62	30.36	66.5	30.32	62	66.5	49.5	17	58	–
22	30.23	57.5	30.18	65.5	30.11	61	65.5	49	16.5	57.2	–
23	30.02	58.5	30.00	73.5	30.00	70	73.5	55.5	18	64.5	–
24	30.01	64	30.03	78	30.03	73	78	60.5	17.5	69.2	.01
25	30.08	62	30.11	63	30.10	62	64	54.5	9.5	59.2	–
26	30.08	61	30.00	78	29.94	79	80	60.5	19.5	70.2	–
27	29.99	71.5	29.99	79	29.95	77.5	79	62.5	16.5	70.7	–
28	29.96	74.5	29.95	75	29.91	73.5	79.5	64	15.5	71.7	–
29	29.96	67.5	29.99	72.5	30.00	66	72	62	10	67	–
30	30.02	63.5	30.00	67	29.92	65	71.5	63.5	8	67.5	.10
31	29.79	71	29.76	76	29.80	66	76.5	55	21.5	65.7	.64
Monthly range									33°		
Monthly mean . . . . . . , . . .										65.62	
Monthly rainfall											3.44

Meteorological Record for September, 1886.

	8 A. M.		1 P. M.		6 P. M.		24 HOURS ENDING 8 A. M.				
Date.	Barometer.	Thermometer.	Barometer.	Thermometer.	Barometer.	Thermometer.	Maximum Thermometer.	Minimum Thermometer.	Daily range.	Daily mean.	Rainfall.
1	30.01	59°	30.08	68°	30.12	64°	68.5°	48.5°	20°	58.5°	–
2	30.33	56	30 38	62.5	30.40	61	64	50.5	13.5	57.2	–
3	30.43	59	30.47	66	30.48	61	66.5	51.5	15	59	–
4	30.50	58	30.52	65	30.50	61	65.5	57.5	8	61.5	–
5	30.48	62	30.47	67	30.46	63.5	68	59	9	63.5	–
6	30.45	68	30.46	70.5	30.45	66.5	72	65.5	6.5	68.7	–
7	30.45	71	30.40	77	30.36	75	78.5	66	12.5	72.2	–
8	30.32	71	30.27	78.5	30.20	76.5	79.5	66.5	13	73	–
9	30.15	71.5	30.11	80.5	30.08	74	81.5	61	20.5	71.2	.34
10	30.01	62	29.98	65.5	29.92	65	71	61	10	66	.01
11	29.86	71	29.90	77	29.90	70.5	77	53	24	65	–
12	29.99	62.5	29.95	76	29.84	69.5	76.5	54.5	22	65.5	.40
13	29.82	57.5	29.85	66.5	29.88	59	67.5	46	21.5	56.7	–
14	30.01	59	30.04	68	30.06	64	69.5	58	11.5	63.7	–
15	30.18	65	30.27	67.5	30.30	60.5	68.5	57.5	11	63	.02
16	30.38	58.5	30.37	60	30.30	61.5	69	58.5	10.5	63.7	.31
17	30.18	69	30.13	76	30.08	72	76	58.5	17.5	67.2	.07
18	30.24	60	30.28	68.5	30.30	64.5	68.5	51.5	17	60	–
19	30.36	61.5	30 32	65.5	30.17	64.5	68	56	12	62	.01
20	29.93	59	29.94	61.5	29.95	51.5	62.5	40.5	22	51.5	–
21	30.03	48.5	30.04	60	30.04	56	64	37.5	26.5	50.7	–
22	30.12	44	30.16	52	30.17	52	62	37	25	49.5	.10
23	30.17	51	30.17	52	30.16	52.5	53	48	5	50.5	1.29
24	30.22	48.5	30.24	63.5	30.22	60	66.5	48.5	18	57.5	–
25	30.28	50	30.31	51.5	30.31	50.5	66	51.5	14.5	58.7	.01
26	30.22	66	30.08	75.5	29.93	68.5	76	64	12	70	–
27	29.91	67	29.94	74.5	30.01	56	74.5	54	20.5	64.2	.39
28	30.04	58	30.01	59	29.95	61.5	63	57	6	60	.12
29	29.87	59	29.94	60.5	29.97	58	62	45	17	53.5	–
30	30.04	48.5	30.04	59.5	29.98	55.5	60	49	11	54.5	–
Monthly range									41°		
Monthly mean										61.29°	
Monthly rainfall											3.07

Meteorological Record for October, 1886.

	8 A. M.		1 P. M.		6 P. M.		24 HOURS ENDING 8 A. M.				
Date.	Barometer.	Thermometer.	Barometer.	Thermometer.	Barometer.	Thermometer.	Maximum Thermometer.	Minimum Thermometer.	Daily range.	Daily mean.	Rainfall.
1	29 83	52.5°	29.81	66°	29.82	52.5°	66°	35°	31°	50.5°	–
2	29.95	41.5	30.01	54	30.06	49	55	36.5	18.5	45.7	–
3	30.17	42.5	30.21	54.5	30.22	52	56	41.5	14.5	48.7	–
4	30.21	51	30.18	63	30.15	57	65	48	17	56.5	–
5	30.12	52	30.16	57	30.18	52.5	58.5	41	17.5	49.7	–
6	30.19	46	30.18	58.5	30.15	53.5	58.5	46.5	12	52.5	–
7	30.17	52.5	30 23	56.5	30.25	50.5	56	41.5	14.5	48.7	–
8	30.27	47.5	30.28	56.5	30.26	56	57	47.5	9.5	52.2	–
9	30.22	56.5	30.20	74.5	30.17	70	75	54.5	20.5	64.7	–
10	30.23	58.5	30.25	62	30.26	57	62.5	48.5	14	55.5	–
11	30.27	55	30.26	69.5	30.23	62.5	68	53	15	60.5	–
12	30.14	60	30.07	74.5	30.01	71	75	50	25	62.5	.03
13	30.05	50	30.11	52	30.14	48.5	52	42	10	47	–
14	30.19	50	30.19	55	30.17	55	67	50	17	58.5	.04
15	29.90	67	29.82	69	29.81	58	70	37	33	53.5	–
16	29.89	38.5	29.94	42.5	29.99	36	48.5	28	20.5	38.2	–
17	30.08	31.5	30.10	42.5	30.11	42.5	47.5	32	15.5	39.7	.07
18	30.12	45	30.20	50	30.26	47.5	52.5	40.5	12	46.5	–
19	30.38	41.5	30.43	50.5	30.46	46	52.5	38	14.5	45.2	–
20	30.47	43.5	30.48	59	30.43	54.5	60.5	43.5	17	52	–
21	30.17	58	30.05	64.5	30.05	52	65	36.5	28.5	50.7	–
22	30.10	41.5	30.10	57	30.08	57	60.5	42	18.5	51.2	–
23	30.08	50.5	30.12	54	30.13	47	54.5	33	21.5	43.7	–
24	30.23	39.5	30.25	44.5	30.27	43.5	46	36.5	9.5	41.2	–
25	30.28	46	30.07	57.5	30.26	56	61	47	14	54	–
26	30.28	50.5	30.35	47.5	30.38	46	51.5	43.5	8	47.5	.25
27	30.40	43.5	30.39	45.5	30.35	44.5	46.5	41	5.5	43.7	.67
28	30.19	42.5	30.14	46.5	30.12	47	52	42.5	9.5	47.2	.31
29	30.09	50	30.09	48.5	30.09	47	50	46	4	48	.23
30	30.09	46	30.09	45	30.07	44.5	51.5	44	7.5	47.7	1.65
31	29.97	52	29.97	52	29.99	49	53.5	47	6.5	50.2	.08
Monthly range									47°		
Monthly mean										0.14°	
Monthly rainfall											3.33

Meteorological Record for November, 1886.

	8 A. M.		1 P. M.		6 P. M.		24 HOURS ENDING 8 A. M.				
Date.	Barometer.	Thermometer.	Barometer.	Thermometer.	Barometer.	Thermometer.	Maximum Thermometer.	Minimum Thermometer.	Daily range.	Daily mean.	Rainfall.
1	29.98	47°	29.99	55°	30.09	46°	55°	43°	12°	49°	.01
2	30.04	49	30.07	56.5	30.10	49.5	57	47.5	9.5	52.2	–
3	30.13	51.5	30.11	55.5	30.08	54.5	58	51.5	6.5	54.7	–
4	29.94	58	29.94	56	29.98	49	59.5	34	25.5	46.7	–
5	30.08	38.5	30.12	54.5	30.12	50.5	55.5	39.5	16	47.5	–
6	30.18	53	30.15	52.5	30.04	56	57.5	43	14.5	50.2	.67
7	29.63	43.5	29.62	43	29.65	38	42.5	28.5	14	35.5	–
8	29.66	30	29.78	38.5	29.79	32.5	40	31	9	35.5	–
9	29.89	34.5	29.92	46	29.95	45	46.5	34.5	12	40.5	–
10	30.01	39	30.03	52	30.04	44	52	39	13	45.5	.16
11	30.05	41	30.06	53	30.06	50.5	53.5	36.5	17	45	–
12	30.09	39	30.10	46.5	30.10	43.5	48	39.5	8.5	43.7	.78
13	30.02	43.5	29.96	36	29.92	34	45.5	29.5	16	37.5	.18
14	29.85	30.5	29.85	37.5	29.86	33	38	31	7	34.5	–
15	29.88	38	29.91	42.5	29.93	37.5	43.5	30	13.5	36.7	–
16	30.07	31	30.11	38.5	30.24	33.5	39	30	9	34.5	–
17	30.10	37.5	30.19	39	30.19	43	58	39	19	48.5	.25
18	30.17	58	29.80	62	29.64	50.5	62.5	37.5	25	50	.28
19	29.70	40	29.70	38.5	29.72	35	41.5	33.5	8	37.5	–
20	29.76	35.5	29.76	45.5	29.76	42	46	36	10	41	–
21	29.79	38	29.81	45.5	29.83	43	47.5	33	14.5	40.2	–
22	29.92	34	29.95	43.5	29.98	38	55.5	34.5	21	45	–
23	30.03	41	29.99	46	29.89	52.5	60.5	41.5	19	51	.55
24	29.63	49.5	29.64	52	29.70	40.5	53.5	37	16.5	45.2	–
25	29.92	37.5	29.94	39	29.93	39.5	44	34	10	39	.33
26	29.86	34	29.91	38	29.95	35	38.5	27	11.5	32.7	–
27	30.07	28	30.09	37	30.10	35	38.5	25	13.5	31.7	–
28	30.13	27.5	30.13	38	30.13	36	42.5	29	13.5	35.7	–
29	30.12	42.5	30.10	50.5	30.07	47.5	50.5	38.5	12	44.5	–
30	29.99	39.5	29.97	47.5	29.94	53.5	48	40.5	7.5	44.2	.12
Monthly range									37.5°		
Monthly mean										42.53°	
Monthly rainfall											3.33

Meteorological Record for December, 1886.

	8 A. M.		1 P. M.		6 P. M.		24 HOURS ENDING 8 A. M.				
Date.	Barometer.	Thermometer.	Barometer.	Thermometer.	Barometer.	Thermometer.	Maximum Thermometer.	Minimum Thermometer.	Daily range.	Daily mean.	Rainfall.
1	29.74	41.5°	29.74	41.5°	29.75	36°	42.5°	29°	13.5°	35.7°	.04
2	29.73	29	29.72	23	29.72	21.5	29.5	12.5	17	21	–
3	29.73	13.5	29.75	20	29.78	16	21.5	12.5	9	17	–
4	29.88	13	29.95	23	30.03	19	24.5	7.5	17	16	–
5	30.18	9.5	30.19	12.5	30.20	13	19	9.5	9.5	14.2	.39
6	30.18	19	30.18	25	30.18	25.5	30.5	17.5	13	24	.03
7	30.18	18	30.17	20	30.15	21	26	18	8	22	.29
8	30.14	20.5	30.14	31	30.14	30.5	35	21.5	13.5	28.2	–
9	30.17	32.5	30.18	40.5	30.19	35	41	20	21	30.5	–
10	30.24	20	30.24	39.5	30.24	37.5	40.5	31.5	9	36	–
11	30.23	33	30.23	47.5	30.23	43.5	48	35	13	41.5	–
12	30.24	41	30.24	42.5	30.24	39	42.5	30	12.5	36.2	.04
13	30.18	31	30.15	35	30.12	32	38	31	7	34.5	.09
14	30.00	38	29.98	38.5	29.96	32	39.5	30.5	9	35	–
15	29.93	35	29.91	46	29.90	40.5	46	16.5	29.5	31.2	.11
16	29.86	16.5	29.85	13.5	29.85	13	19	10.5	8.5	14.7	.14
17	29.92	13	29.98	24	30.01	21.5	35	13	22	24	–
18	30.17	33.5	30.16	38.5	30.14	40.5	43	34.5	8.5	38.7	1.14
19	30.07	37	30.07	42.5	30.09	39	42	30.5	11.5	36.2	–
20	30.11	30.5	30.12	36	30.12	31.5	42	22	20	32	–
21	30.13	22.5	30.14	36.5	30.13	33	38	23.5	14.5	30.7	–
22	30.14	32	30.15	41.5	30.16	39.5	42	28	14	35	–
23	30.22	28	30.24	38.5	30.26	39.55	40.5	28.5	12	34.5	.01
24	30.26	40.5	30.21	49.5	30.14	46	50.5	35.5	15	43	1.13
25	29.94	35.5	29.95	34	29.99	23	35.5	13.5	22	24.5	–
26	30.01	16	30.02	21	30.04	28	29.5	15.5	14	22.5	–
27	30.02	27	30.02	35	30.03	28	35.5	15.5	20	25.5	.03
28	30.06	17	30.08	23	30.09	21.5	25	17.5	8	21.5	–
29	30.10	18.5	30.10	20.5	30.12	16	22.5	5	17.5	13.7	.06
30	30.14	5.5	30.16	11	30.17	10	12.5	5	7.5	8.7	.10
31	30.20	11.5	30.20	22	30.19	33	35	11	24	23	.91
Monthly range									45.5°		
Monthly mean										27.43°	
Monthly rainfall											4.51

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SIXTEENTH ANNUAL REPORT

OF THE

PUBLIC WATER BOARD

OF THE

CITY OF LYNN,

FOR THE YEAR ENDING DECEMBER 31, 1887.

LYNN, MASS.:
WOODBURY S. PRENTISS.
1888.

SIXTEENTH ANNUAL REPORT

OF THE

PUBLIC WATER BOARD

OF THE

CITY OF LYNN,

FOR THE YEAR ENDING DECEMBER 31, 1887.

Compliments of

The Public Water Board.

R. L. M.

SIXTEENTH ANNUAL REPORT

OF THE

PUBLIC WATER BOARD

OF THE

CITY OF LYNN,

FOR THE YEAR ENDING DECEMBER 31, 1887.

LYNN, MASS.:
WOODBURY S. PRENTISS.
1888.

R. L. M.

OFFICERS FOR 1887.

D. H. Sweetser, *President*,
For two years.

Alfred A. Mower,
For three years.

Albert A. Davis,
For one year.

David Knox,
For four years.

Edwin Bates.
For five years.

Superintendent and Clerk—Daniel Walden.
Water Registrar—Frank McCullough.
Pumping Engineer—W. H. Messinger.
Foreman of Piping—Edwin Maxwell.
Foreman of Services—George Sanborn.
Inspectors—Winslow J. Rowell, Willis L. Snow, J. Frank Pool.

PUBLIC WATER BOARD FOR 1888.

D. H. Sweetser, for one year.
Alfred A. Mower, for two years.
David Knox, for three years.
Edwin Bates, for four years.
Edward B. Billings, for five years.

ANNUAL REPORT.

Office of the Public Water Board,
January 20, 1888.

To the Honorable Mayor and City Council of the City of Lynn:

The sixteenth annual report of the Public Water Board is hereby presented, together with the reports of the Superintendent and Water Registrar. These reports deal fully with the details and practical working of the department, and contain much information of general interest.

The first and most important question to consider in reviewing the condition of this department, is the capacity of the works to furnish at all times an unfailing and abundant supply of water. If the quantity of water is insufficient, no matter how elaborate or costly the works, they must be regarded as a failure. The supply must be ample for dry as well as rainy seasons, and the storage sufficient to carry us through times of drought, following a period of low rainfall.

In a growing community like ours, it may be said the public water works are never finished. No sooner is an improvement or extension completed, than the growth of the city requires new extensions of the works to keep pace with the rapid increase in the consumption of water. The increase of population is to be provided for, new streets are to be piped, new houses supplied with water, and the old houses are constantly being fitted with the modern water conveniences.

A constant watchfulness, both of the consumption of water and the sources of supply, is required of those having this department in charge. In providing a public water supply, we have invited our people to discontinue the use of wells and cisterns, both for manufacturing and domestic use. With the growth of confidence, it has become practically their only resource. The old wells have so long been abandoned that but few would be found available or fit for use. A grave responsibility rests with those who have undertaken to furnish the public with water, for serious consequences would arise if the supply should fail and the city be shut off from water even for a short time.

Since the construction of the canal, which conveys the waters of Hawkes and Penney brooks to the pumping station, our experience has shown that it can be relied upon to supply us with water for about six months in the year. Sometime during the months of November or December, the brooks, fed by the fall rains, commence running, and continue to furnish most of the city's supply till May or June, varying somewhat in different years, according to the rainfall. The remaining six months of the year, say from June to December, our reliance for the city's supply is upon the water stored in Breed's and Birch ponds. By raising the dam at Birch pond the capacity of this basin was nearly doubled, but it was found that the pond could not be filled from its own watershed during the time we were using the water from the brooks. In order to make this increased storage capacity available, and to ensure full ponds at the commencement of the summer season, a pumping engine was placed at the head of Birch pond to pump from the canal into the pond some of the water that in the winter and spring months was running to waste. By this device we are enabled to fill the ponds, but having now reached the limit of our capacity with the present storage basins, we must forecast our future wants and take measures to anticipate and provide for them.

Admitting, then, that we can rely with our present plant upon full ponds at the beginning of the summer season, and knowing accurately the capacity of these ponds, we have the data at hand to form an estimate of our requirements in the near future.

The storage capacity of our ponds above a plane of six feet is 561,786,000 gallons. An allowance of 20,000,000 gallons for the loss by evaporation above the rainfall for six months, will leave 541,786,000 gallons available for use. The consumption of water for the six months from June 1 to Dec. 1 in 1887 was 457,575,234 gallons, an increase over the previous year for the same months of about 8%. Last summer the conditions were unusually favorable for a low consumption of water, and, as we cannot rely upon the continuance of these favorable conditions, we should estimate the increase of consumption at least at 10% ; which is about the average increase of the past five years. On this basis the consumption in 1889, for the six months from June to December, will be 553,664,000 gallons, or 12,000,000 gallons more than the available storage.

With these facts in view, and considering that our city is growing at a rate that doubles its population every twenty years, and that the consumption of water shows an average yearly increase of more than ten per cent., we should no longer delay the construction of additional storage basins. In Hawkes and Penney brooks we have a sufficient supply of water for many years to come, but it must be remembered that the water from these sources is furnished in six months in the year, and the remaining six months we must rely upon our storage basins. Not more than one-fourth of the yield of the brooks can be utilized under our present system, the other three-fourths is wasted. The increase in consumption will soon require that some of this water now running to waste be utilized by storing it in basins. As it will take two seasons to properly construct these basins, it would appear imperative that we should commence work this summer. The expense of building storage basins at Hawkes and Penney brooks will add to our construction account, but the income of the department will be increased in a greater ratio.

If we build new dams it is because of an increasing demand for water, and an increased demand for water means increased receipts for its use. Notwithstanding the large sums expended the past few years in costly construction, the revenue has steadily gained, so that the financial exhibit this year shows, after paying interest on the water debt, the repairs and running expenses of the department, a surplus of over $36,000, to be carried to the sinking fund for the extinguishment of the water debt.

With this gratifying fact in view, there should be no hesitancy on the part of the City Council in granting the Water Board the authority to proceed with the work of constructing new storage basins, and we respectfully ask of the City Council that the matter receive early consideration.

PUMPING ENGINE.

The increasing demand for water necessitates another pumping engine, to take the place of the Deane engine, which would be found too small to supply the city with water in case of any accident to the large engine. The Leavitt engine has been in almost constant use for fifteen years, and has been proved, both in the economy with which it is run and the duty which it performs, one of the best pumping engines ever constructed. Accidents, however, are liable to occur to any machine, and should the Leavitt pump from any cause give out, the Deane pump would be unable to pump water enough to supply the city. With the consumption of five years ago, this pump would answer as a relief engine, but we have now outgrown it, and as it will require at least twelve months after giving out a contract before a suitable pumping engine could be furnished, we would recommend that some action be taken the present year to procure one.

FINANCIAL.

The surplus revenue of the department, after paying interest and maintenance for the year, was $36,682. This carried to the sinking funds makes the total amount of those funds $241,425.34. The water debt, less the cash standing to the credit of the department, is $1,324,821.28. Deducting the amount of the sinking funds, it will leave $1,083,395.94. This sum is the cost of our water works as represented by the water debt, which will ultimately be paid off by the constantly increasing and accumulating sinking funds. This valuable property will then belong to the city, free from incumbrance. The value of the water works as a piece of property can be estimated by considering the income derived from them. Upon this basis, we can safely estimate them at $2,000,000. The income is now sufficient, after paying all expenses, to pay five per cent. on this amount, and as the net income is constantly increasing, the valuation given may be considered a very conservative one.

STREET MAINS.

The powers of the Water Board are limited. It has no authority to lay street mains until ordered to do so by the City Council. All applications for water pipes in new streets go to the City Council, are referred to the Committee on Water Supply, and upon their report the pipes are ordered laid or the applications rejected. Practically the decision of the question of laying new pipes rests with the water supply committee. This committee, changing from year to year, some of its members having so limited a knowledge of matters relating to our water supply that they would require a guide to find our storage basins, can hardly be expected to possess the information necessary for intelligent action upon this question. The recommendations of the Water Board are often entirely ignored and pipes have been ordered laid in streets without grade or a proper laying out, and in some cases where the location of the streets could only be found on paper.

Reports on applications are often delayed in committee till the last of the year and then rushed through in a batch; too late in the season to properly do the work. In our previous reports we have urged upon the City Council the policy of leaving this matter with the Water Board. The facts are in their possession, and it should be for them to determine whether the applications should be granted. We would therefore recommend the passage of an order by the City Council, authorizing the Water Board to lay street mains wherever in their judgment it would be for the best interests of the city. If such an order be passed, all applications for water pipes would be made to the board and would receive prompt attention.

PUBLIC WATER BOARD,
By D. H. SWEETSER, *President.*

REPORT OF THE WATER REGISTRAR.

D. H. Sweetser, Esq., President Public Water Board:

SIR,—In compliance with the city ordinance, I take pleasure in presenting herewith the report of the Water Registrar for the year ending Dec. 31, 1887:

SERVICES.

Whole number of services Jan. 1, 1887	7,374	
Put in during the year	431	
Total number Jan. 1, 1888		7,805
New services let on during the year		370
Services shut off during the year for non-payment		50
Services let on by payment of rates and fines		43
Services let on for other parties by change of ownership or occupancy		11
Services shut off by request, or for vacancy		73
Services let on, premises re-occupied		96
Services discontinued		2
Services put in at Saugus during the year		18
Making the whole number in Saugus Jan. 1, 1888		90

There are twenty-two applications for services in Saugus on file, to be put in as soon as the season will permit.

The ratio of increase yearly in the number of services for the past twelve years is as follows:

1876	6.54 per cent.	1882	9.92 per cent.
1877	7.60 " "	1883	10.80 " "
1878	6.14 " "	1884	8.62 " "
1879	6.04 " "	1885	6.36 " "
1880	8.75 " "	1886	6.58 " "
1881	10.25 " "	1887	5.84 " "

RECEIPTS FOR THE YEAR 1887.

For the use of water for all purposes	$122,142 52	
For rent, wood, grass, stones, etc.	86 03	
For damaged goods	10 00	
For seal locks	3 75	
For fines, shutting off and letting on	107 00	
For summons	138 20	
For extra pipe, labor, etc.	2,798 94	
		$125,286 44

The whole amount of which has been paid into the city treasury, and the Treasurer's receipts taken therefor.

There is due and uncollected on ordinary water rates, $728.05; on meter rates, $4,904.69.

EXPENDITURES FOR THE YEAR 1887.

MAINTENANCE.

Salaries and office expenses	$5,256 97	
Repairs on services	2,089 54	
Repairs on mains, hydrants and gates	4,052 86	
Pumping, wages, coal, oil, etc.	6,350 47	
Stable and workshop	1,047 55	
Meters	398 89	
New supply	1,234 07	
Engines and boilers	198 10	
Damages	1,049 37	
Tubular wells	1 25	
Reservoir	121 93	
Breed's pond	36 00	
Birch pond	115 50	
Total		$21,952 50

CONSTRUCTION.

Services and court mains	$9,150 17	
Mains, hydrants and gates	14,977 00	
New supply	6,027 57	
Meters	704 66	
Tubular wells	664 01	
Breed's pond	13 50	
Birch pond	50 26	
High service	31 25	
Pipe conduit and right of way	1,508 00	
Total		$33,126 42

COMPARATIVE STATEMENT OF REVENUE FOR 1887.

Amount due and uncollected Jan. 1, 1888 . .	$5,632 74	
Amount collected for the year	122,487 50	
		$128,120 24
Deduct amount due Jan. 1, 1887		4,612 51
Revenue for 1887		$123,507 73
Revenue for 1886		116,375 70
Increase of revenue for 1887		$7,132 03

STATEMENT OF INTEREST, MAINTENANCE AND REVENUE FOR 1887.

Revenue for 1887		$123,507 73
Maintenance	$21,952 50	
Interest	65,981 00	
		87,933 50
Balance		$35,574 23

Following will be found the usual tables, exhibiting the number of buildings, families, stores, factories, etc., supplied with water, the class of premises to which meters are attached, the number and kinds of fixtures, the yearly revenues of the department, etc., etc.

Respectfully submitted.

FRANK McCULLOUGH,
Water Registrar.

STATEMENT

SHOWING THE NUMBER OF BUILDINGS TO WHICH WATER IS SUPPLIED, ALSO, THE NUMBER OF FAMILIES, VARIOUS FIXTURES, ETC., CONTAINED IN THE SAME, TOGETHER WITH THE NUMBER OF FIRE HYDRANTS, DECEMBER 31, 1887.

Buildings	7.217
Factories	163
Stores and shops	696
Offices	212
Restaurants and saloons	129
Families	10,783
Boarding-houses	155
Faucets	17,229
Bathtubs	1,356
Water-closets	4,003
Urinals	227
Hand-hose	2,322
Steam heaters	164
Stationary engine	110
Elevators	1
Motors	16
Gas machines	2
Gas engines	4
Fire hydrants	590

STATEMENT

SHOWING THE CLASS OF PREMISES TO WHICH METERS ARE ATTACHED.

CLASS.	SIZES.									Total
	⅛	⅝	¾	1	1¼	1½	2	3	4	
Bathrooms	–	1	–	–	–	–	–	–	–	1
Board of Health, flushing sewers .	–	–	–	–	–	–	1	–	–	1
Brewery	–	–	–	–	–	1	–	–	–	1
Brickyards	–	–	–	2	–	–	–	–	–	2
Churches	–	1	–	–	1	–	–	–	–	2
City Stable	–	–	–	1	–	–	–	–	–	1
Dwellings	–	8	5	–	–	–	–	–	–	13
Elevators	–	–	–	–	–	–	1	–	–	1
Engines	–	2	7	12	2	3	1	–	1	28
Factories	4	15	57	41	2	2	–	–	–	121
Fire engine houses	–	–	1	1	–	–	–	–	–	2
Foundries	–	–	–	–	–	–	1	–	–	1
Gas works	–	–	–	–	–	2	–	–	–	2
Halls and buildings	–	2	7	11	–	1	–	–	–	21
Hotels	–	1	3	1	–	–	–	–	–	5
Laundries	–	1	5	1	–	–	–	–	–	7
Livery Stables	–	5	2	1	–	–	–	–	–	8
Medical laboratory	–	–	–	1	–	–	–	–	–	1
Oil works	–	–	–	1	–	–	–	–	–	1
Printing office	–	1	–	–	–	–	–	–	–	1
Railroads	–	1	7	2	–	1	–	1	1	13
Saloons	–	–	–	2	–	–	–	–	–	2
Tugs and vessels	–	–	–	–	–	–	1	–	–	1
Motors (registering) . . 8	–	–	–	–	–	–	–	–	–	–
Totals	4	38	94	77	5	10	5	1	2	236

STATEMENT

SHOWING THE YEARLY REVENUE OF THE DEPARTMENT SINCE THE FIRST INTRODUCTION OF WATER INTO THE CITY IN 1871.

From October 1, 1871, to January 1, 1872	$8,989 00
From January 1, 1872, to January 1, 1873	27,568 16
From January 1, 1873, to January 1, 1874	47,992 61
From January 1, 1874, to January 1, 1875	53,545 61
From January 1, 1875, to January 1, 1876	52,553 26
From January 1, 1876, to January 1, 1877	60,867 12
From January 1, 1877, to January 1, 1878	64,002 50
From January 1, 1878, to January 1, 1879	67,570 14
From January 1, 1879, to January 1, 1880	73,949 80
From January 1, 1880, to January 1, 1881	79,635 12
From January 1, 1881, to January 1, 1882	80,967 76
From January 1, 1882, to January 1, 1883	94,419 52
From January 1, 1883, to January 1, 1884	98,893 54
From January 1, 1884, to January 1, 1885	114,903 86
From January 1, 1885, to January 1, 1886	110,089 11
From January 1, 1886, to January 1, 1887	116,375 70
From January 1, 1887, to January 1, 1888	123,507 73
	$1,275,830 54

STATEMENT

SHOWING COST OF WORKS TO JANUARY 1, 1888.

Mains, hydrants and gates	$600,222 58	
Services and court mains	186,661 66	
New supply and land	140,026 18	
Reservoir and land	131,581 49	
Birch pond and land	86,707 60	
Engine and boilers	71,998 00	
Engine-house and land	56,674 05	
Pipe conduit and right of way	45,293 98	
Breed's pond and land	38,016 65	
Force main and land	24,614 00	
Highland service	21,565 52	
Meters	9,356 82	
Engineering	8,564 99	
Tubular wells	8,046 05	
Workshop and stable	1,957 12	
		$1,431,286 69
Less amount received for extra pipe, labor, etc.,		58,815 10
Total net cost to date		$1,372,471 59

REPORT OF THE SUPERINTENDENT.

LYNN, January 5, 1888.

D. H. Sweetser, Esq., President of the Public Water Board:

SIR,—In compliance with the city ordinance I respectfully submit herewith the Annual Report of the Superintendent, for the year 1887.

NEW SUPPLY.

From the 1st of January until the 12th of March all the water received from the new supply was pumped direct to the reservoir for the daily supply of the city; the amount received was 140,063,250 gallons. The consumption for the same time was 164,472,260 gallons, the difference being taken from Breed's pond.

On the 12th of March the centrifugal pump mentioned in the last annual report, for pumping the water from the canal into Birch pond, had been set up in the gate-house at the westerly end of the pond, the boiler and an Ide engine for running the pump being placed in a small annex, were finished and started up and run day and night until the 28th of March, with the exception of three days while the canal was undergoing some necessary repairs; when the pond was nearly full the pumping was stopped; the amount pumped into the pond during this time was 72,000,000 gallons. From the 28th of March to the 11th of June, all the water that could be utilized from the canal was pumped into the reservoir for the daily consumption of the city. The total quantity thus obtained from the canal for immediate use, from January 1st to June 11th, was 195,000,000 gallons. In the fall the rains were very late, the first water taken from the canal was November 17th, and the first day a full supply was received was December 12th, since which time most of the supply has been received from that source. The total amount received from the canal this year, including the amount pumped into Birch pond, has been 327,239,373 gallons. During the summer the flume at Hawkes brook was thoroughly repaired, the tunnel and canal were cleaned of accumulations of sand, decayed leaves, etc., and all necessary repairs made to the embankments and overflows, and that portion of the works is now in good condition.

PONDS.

The winter and spring rains filled Breed's pond by the first of April and there was a small waste over the flashboards; the concrete placed on the inside of the dam in the fall of 1886 proved perfectly successful in stopping the percolation between the puddle and the curbing. There has been no appearance of any percolation during the year; no repairs have been required for the year; a small amount has been expended in clearing the dam of weeds and grass, but the grounds around and below the dam can never be kept in a creditable condition until they are properly fenced to protect them from the cattle, which are allowed to run at large; the expense would not be very large, and I would recommend it to the favorable consideration of the Board. Birch pond, with the aid of the pump set up in the gate-house, was filled for the first time since the dam was raised, and during a portion of April there was some waste at the overflow; the puddle wall put in last year at the upper end of the pond has stopped all percolation from the pond in that direction, and by careful tests the leak from the pond into the tunnel seems to be entirely stopped. On the 1st of June both ponds were full, insuring an abundant supply for the year; the quality also has been excellent throughout the season, and for softness and purity it will compare favorably with the water furnished to other cities. The surplus above the consumption of the year has been reserved in Birch pond, hoping thereby to be able to fill that pond the coming winter and spring from its own watershed without resorting to the expensive process of pumping from the canal.

On the 31st of December, 1886, Breed's pond contained 12 feet 11½ inches, and Birch pond contained 15 feet 9 inches. On December 31, 1887, Breed's pond contained 9 feet 8 inches, and Birch pond contained 15 feet 9 inches. The rainfall has been 48.86 inches; the yield from the water shed of both ponds, exclusive of water surfaces, has been 650,612,597 gallons, equal to 55.54 per cent. of the rainfall. The same percentage of yield from the watershed of the new supply would give a yield for that source of 1,695,000,000 gallons. The consumption for the year has been 868,346,338 gallons, an average of 2,379,031 gallons per day, and an increase over last year of 95,897,201 gallons.

In the last annual report it was shown that an additional amount of storage must soon be provided for the water that now runs to waste from the brooks in North Saugus which form the new supply. From the 1st of June till the 12th of December, with the exception of a few days, the supply to the city was taken from the ponds, showing that at least six months' storage is necessary to secure a full supply to the city. Our present storage, allowing for evaporation, amounts to 541,000,000 gallons; the consumption this year for the six months from June 1st to December 1st, was 457,575,234 gallons, an increase over last year for the same six months of a little more than eight per cent. The same ratio of increase for the next two years will require 539,000,000 gallons for the six months' consumption in 1889, but this has been a favorable year for a low summer consumption and the increase is liable to be much larger. In 1886 the increase was 16¾ per cent., giving an average for the two years of 12.4 per cent., which would require 572,000,000 gallons to supply the city during those six months in 1889. If further evidence of the necessity of more storage were necessary it can be found in the fact that before the dam at Birch pond was raised, the storage capacity above six feet was 382,000,000 gallons, while the six months' consumption of 1885 was 362,000,000 gallons, and it was well known that unless the dam was raised we should be out of water. The raising of the dam in 1885 increased the storage capacity about 180,000,000 gallons. In 1886 and 1887 the consumption in the six months has increased 95,000,000 gallons, with the same increase in the next two years the storage gained by raising the dam will be more than swallowed up. It will probably take two working seasons to build a basin in North Saugus and complete it ready for use.

It should be borne in mind that the population of the city is rapidly increasing; that it has doubled itself every 20 years for the last 60 years; that in 1890, with the same ratio of increase, the city will contain 56,000 inhabitants, and will require 600,000,000 gallons of water for consumption in the six summer months, in addition to which the Town of Saugus must also be supplied. On the 18th of July, an agreement was made between the city government and the selectmen of the Town of Saugus to furnish that town with water for domestic and other uses; under that agreement the town has laid 7¾ miles of pipe, and a few services have been put in. The lateness of the season prevented further services from being connected; there will be a large number of services connected in the spring, all of which will tend to increase the consumption and make the increase in storage more necessary. It must be evident from all the facts that an increase in storage is absolutely necessary, and that no time should be lost in making the necessary preparations and surveys for commencing the work.

RESERVOIR.

The reservoir has not required any repairs during the year, and is now in good condition.

TUBULAR WELLS.

The tubular wells have not been in use for the year, the engine and boilers have been examined at different times, and care taken to have them in order for any emergency that might arise, but it is doubtful if the gang of wells could be depended upon ; probably they would have to be renewed if it should become necessary to put them in use again.

PUMPING STATION.

The buildings at the pumping station are in good condition and have required but slight expenditure during the year. The boilers and settings have received some necessary repairs and are now pronounced by the inspector of the "Hartford Steam Boiler Inspection and Insurance Co." to be in good condition externally and internally. The Leavitt engine requires some new valves, and new brasses to the connecting rods, and some other slight repairs, all of which will be made as soon as the valves and brasses are finished. This engine has pumped all the water which has been used in the city since November, 1884, without any expense for repairs, other than that done by the engineer, and still maintains its reputation for high duty, and the economy with which its work is performed. The Deane engine has not been in use for the year ; it is too expensive to run in competition with the Leavitt engine, except in case of necessity, and it is now too small to supply the city during the time of maximum consumption, and should be exchanged for an engine of larger capacity and a higher rate of duty, at the earliest practicable time. In case of an accident to the Leavitt engine during the summer months, when the consumption is at the maximum, the Deane engine would not be equal to furnishing a full supply of water for the daily requirements of the city, and much inconvenience to the citizens would be the result. The rapidly increasing demands of the city must be met by increasing the facilities for supplying those demands.

PIPES.

Eleven thousand, seven hundred and forty-two and three-tenths feet of pipe, from 4″ to 10″, has been laid in 29 different streets, and 1,233.8 feet of smaller sizes has been laid in courts as mains. The 16-inch main in Summer street has been extended from Pleasant street to Market street by laying 720.5 feet of 16-inch cast-iron pipe, to take the place of the same number of feet of 10-inch wrought iron cement-lined pipe, which has been discontinued. The total extension of the distribution pipe for the year is two miles, 2,415 feet; all the pipe laid this year has been of cast-iron.

One hundred and thirty-nine feet of pipe on Adams street has been lowered, mostly in ledge, also the services connected with it, at a cost of $376.85; the work was made necessary on account of lowering the grade of the street. Such expense would not occur if the City Council would cause all streets to be brought to a proper grade before the pipe is laid.

Eighteen hydrants have been set in connection with new pipe laid, and four hydrants have been taken up and reset, the location having been changed. Twenty-seven gates have been set in connection with new pipe laid, and one on pipe previously laid. Four hundred and thirty-one services have been put in during the year, of an aggregate length of 19,952.5 feet, one 4-inch service, and one 6-inch service have been put in for automatic sprinklers, to be used in case of fire. Four standpipes for watering carts have been put in, and two have been changed to a new location. Nine hundred and thirteen feet of service pipe has been laid in Pine Grove Cemetery. In Saugus, 18 services have been put in of an aggregate length of 947.10 feet, which have been paid for by the owners. Four services have been lowered on account of change of grade in the street, 28 new meters have been set, 42 meters have been taken out, repaired and reset, and three meters have been discontinued. Four hundred and eighteen corporations filled with rust have been dug up and drilled out, 29 lead connections, and 30 new stop and waste-cocks, have been put in to replace broken ones. Twenty-six gate-boxes and 239 stop-boxes that were decayed have been taken out and replaced with new ones.

So far as can be seen, with the exceptions named, the works are in good working condition.

There is now connected with the works over 90 miles of pipe, as follows: 81 miles in Lynn, nine miles in Saugus, and 1,778 feet of private pipe in Swampscott.

Annexed please find the usual tables, containing the record of the work done by the Leavitt engine, with the cost of pumping per million gallons, the rainfall, with the amount and percentage collected for use. Tables, showing the pipe laid and work done, and a meteorological record for the year.

Respectfully submitted,

DANIEL WALDEN,

Superintendent.

TABLE I.

Record of the Leavitt Engine for the Year Ending December 31, 1887.

DATE.	No. of pumping days.	Average pumping time per day.	Total pumping time per month.	Number of revolutions per month.	Average revolutions per minute.	COAL CONSUMED.				Ashes and cinders.	Ashes and cinders.	Gallons pumped per month, allowing 4 per cent. for loss of action in the pump.	Average number of gallons pumped per pound of coal.	Average number of gallons raised 100 feet high per pound of coal.	Average head against the pump.	Average duty in lbs. of water raised one foot high per 100 lbs. of coal, no deduction for ashes and cinders.	Average duty in lbs. of water raised one foot high per 100 pounds of coal, the ashes and cinders deducted.	Oil.	Waste.
						Raising steam.	Pumping.	Banking.	Total.										
Month.	Days	H.M.	H. M.	Rev.	Rev.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Per ct.	Gallons.	Galls.	Galls.	Feet.	Pounds.	Pounds.	Gal.	Lbs.
January . .	26	13.23	339.00	378,630	18.56	7.800	89,450	5,200	102,450	9,660	9.02	70,633,429	689.4	1,149.57	166.75	99,823,358	110,215,573	7	10
February .	24	12.52	309.00	345,098	18.61	7,200	80,000	6,000	93,200	8,950	9.60	64,378,033	690.7	1,151.74	166.75	100,012,814	110,637,321	7	9
March . . .	26	12.55	324.00	371,848	18.44	7,800	85,200	5,200	98,200	10,510	10.56	69,368,245	706.4	1,166.65	166.57	102,164,853	114,409,722	6	10
April . . .	25	12.29	312.00	348,450	18.61	7,500	79,150	5,000	91,650	7,400	8.07	65,003,346	709.2	1,181.74	166.63	102,635,216	111,646,454	7	10
May	26	13.16	345.00	382,900	18.50	7,800	86,700	5,200	99,700	8,650	8.59	71,429,995	716.4	1,193.31	166.57	103,618,609	113,462,662	8	10
June	26	13.58	363.00	402,194	18.46	7,800	90,750	5,200	103,750	9,310	8.97	75,029,290	723.1	1,205.76	166.75	104,707,213	114,923,374	8	10
July	30	14.42	441.00	491,211	18.56	8,800	112,100	5,400	126,300	13,600	10.77	91,635,410	725.5	1,214.27	167.37	105,446,747	118,161,680	9	12
August . .	31	12.50	398.00	432,366	18.10	9,300	84,850	6,200	113,400	14,490	12.78	80,657,879	711.1	1,189.88	167.33	103,340,143	118,479,145	8.5	12
September	30	12.06	363.00	405,418	18.61	8,700	93,050	5,800	107,550	10,980	10.21	75,630,727	703.2	1,184.75	168.48	102,875,186	114,574,156	8	12
October . .	31	11.19	357.00	388,202	18.12	9,000	89,450	6,000	104,450	10,670	10.21	72,419,083	693.3	1,168.76	168.58	101,430,281	112,970,600	9	15
November	29	11.13	333.30	333,146	17.06	8,700	77,450	5,800	91,950	9,300	10.11	62,148,386	675.8	1,128.58	168.48	98,878,277	108,794,405	9	8
December .	28	12.26	348.00	371,900	17.76	8,600	89,300	5,200	103,100	11,680	11.32	69,377,945	673.7	1,135.05	168.48	98,443,157	111,020,559	9	10
Totals and averages.	332	12.57	4,234.30	4,651,363	18.30	99,000	1,070,500	66,200	1,235,700	125,200	10.13	867,711,768	702.2	1,175.41	167.39	102,059,543	113,565,941	95.5	128

Cost of Pumping with the Leavitt Engine for the Year 1887.

490,000 pounds of coal, at $3,57 per net ton		$874 65
752,300 pounds of coal, at $4.90 per net ton		1,843 13
Oil, waste and packing		127 56
Repairs to boilers and furnaces		200 65
Sundry small stores		36 59
Insurance		37 50
Wages of Engineers and Firemen		3,231 08
		$6,351 16
Cost of raising one million gallons into the reservoir	$7 31.94	
Cost of raising one million gallons one foot high	0 04.37	

TABLE II.

SHOWING THE CONSUMPTION OF WATER FOR THE YEAR ENDING DECEMBER 31, 1887.

	Monthly consumption.	Average consumption per day.	Average daily increase.	Average daily decrease.	Average to each consumer.	Average to each inhabitant.
Month.	Gallons.	Gallons.	Gallons.	Gallons.	Galls.	Galls.
January . .	72,051,475	2,324,241	237,885		48.4	46.9
February .	64,951,453	2,319,695		4,546	48.3	46.6
March . . .	67,956,890	2,192,158		127,537	45.6	44.3
April . . .	63,638,168	2,121,272		70,886	44.2	42.8
May	72,408,434	2,335,756	214,484		48.6	47.2
June . . .	75,738,311	2,443,171	107,416		50.9	49.3
July	90,536,754	2,920,540	477,379		60.8	59.0
August . .	81,111,972	2,616,515		304,025	54.5	52.8
September.	75,630,728	2,521,024		95,491	52.5	50.9
October . .	72,030,412	2,323,561		197,463	48.4	46.9
November .	62,527,057	2,084,235		239,326	43.4	42.1
December .	69,764,684	2,250,480	166,245		46.9	45.4
Totals and Averages.	868,346,338	2,379,031			49.5	48.1

TABLE III.

SHOWING THE AMOUNT OF RAINFALL ON THE WATERSHED OF THE PONDS, EXCLUSIVE OF THE WATER SURFACES, AMOUNT OF WATER DRAWN FROM THE PONDS, AMOUNT WASTED, AMOUNT RECEIVED INTO THE PONDS, AND PERCENTAGE OF THE RAINFALL AVAILABLE FOR USE, FROM 1874 TO 1887, BOTH INCLUSIVE.

Date.	Rainfall.	Amount of rainfall on the watershed of the ponds.	Amount of water drawn from the ponds for consumption.	Amount of water wasted from the ponds.	STORAGE.		Total amount of the rainfall received into the ponds.	Daily average.	Percentage of the rainfall received into the ponds.	Amount drawn from new supply.	Amount drawn from tubular wells.
					Increase.	Decrease.					
Year.	Inches.	Gallons.	Gallons.	Gallons.	Gallons.	Gallons.	Gallons.	Gallons.	Per ct.	Gallons.	Gallons.
1874	34.92	837,154,949	485,189,801	21,200,000		47,545,394	458,844,407	1,257,108	54.81		
1875	41.85	1,003,305,644	471,387,757	11,609,267	60,281,293		543,278,317	1,488,433	54.24		
1876	45.05	1,080,099,392	395,084,629	20,500,000	74,452,111		490,036,740	1,342,566	45.37		
1877	45.65	1,094,484,734	402,161,193	131,277,511	60,846,704		594,285,408	1,628,179	54.29		
1878	57.36	1,379,911,034	417,678,296	205,081,247	64,712,199		687,471,742	1,883,484	49.82		
1879	41.04	983,957,360	456,319,019	164,095,022		203,370.014	417,044,027	1,142,586	42.38		
1880	37.28	893,809,219	401,905,570			49,803,426	352,102,144	964,663	39.38		50,069,938
1881	46.31	1,110,771,709	439,992,684	42,355,919	138,262,844		620,611,447	1,700,305	55.87		27,093,350
1882	36.39	872,470,956	551,428,907	16,792,968		92,189,985	476,031,890	1,304,197	54.55		
1883	30.14	722,623,655	424,426,586	61,461,602		113,600,091	372,288,097	1,019,967	51.51		144,233,861
1884	47.75	1,144,833,429	541,225,365	104,208,215	53,996,958		699,430,538	1,911,012	61.09	20,882,455	74,426,562
1885	45.01	1,079,140,370	291,234,263	43,286,356	196,294,799		530,815,418	1,454,289	49.19	409,430,001	
1886	48.26	1,154,423,833	529,088,399	62,524,868		129,350,700	462,262,567	1,266,473	40.04	237,674,057	6,847,858
1887	48.86	1,171,446,311	613,106,965	30,142,382	7,363,250		650,612,597	1,782,500	55.54	327,239,373	

TABLE IV.

SHOWING THE DEPTH OF WATER IN THE PONDS FOR EACH WEEK DURING 1887.

Date.		Breed's Pond.		Birch Pond.		Date.		Breed's Pond.		Birch Pond.		Date.		Breed's Pond.		Birch Pond.	
		Feet.	In.	Feet.	In.			Feet.	In.	Feet.	In.			Feet.	In.	Feet.	In.
Jan.	1	13	2	9	10½	May	7	20	11½	22	0	Sept.	3	18	0½	15	4½
"	8	13	7½	10	2	"	14	20	11½	21	9	"	10	17	3	15	3½
"	15	13	9	10	5	"	21	20	10	21	6½	"	17	16	5	15	3
"	22	13	10	10	8	"	28	20	6½	21	6	"	24	15	6½	15	1½
"	29	15	8	11	9	June	4	20	11½	21	6	Oct.	1	14	9	15	0½
Feb.	5	17	9	12	9½	"	11	20	9½	21	3½	"	8	14	0	15	0½
"	12	18	5½	13	1	"	18	20	8½	20	6	"	15	13	2	15	0
"	19	19	1	13	11½	"	25	20	9	19	9½	"	22	12	5	15	0½
"	26	19	7½	14	9	July	2	20	8	19	0	"	29	11	7	14	11½
March	5	19	11½	15	4	"	9	20	6¼	17	11	Nov.	5	10	9	14	10½
"	12	20	0½	16	1	"	16	20	6	17	0½	"	12	10	0½	14	10
"	19	18	8½	17	5½	"	23	20	4	16	7½	"	19	9	7	15	0
"	26	20	4½	20	2	"	30	20	2	16	6	"	26	9	3	15	0½
April	2	21	0	21	5	Aug.	6	19	8½	16	2	Dec.	3	8	9	15	1
"	9	20	11¼	21	8	"	13	19	1½	15	8	"	10	8	1½	15	1½
"	16	20	11½	21	10	"	20	18	7	15	3½	"	17	8	7½	15	4
"	23	20	11	21	11	"	27	18	9½	15	6½	"	24	9	3	15	6½
"	30	21	2	22	2½							"	31	9	8	15	9

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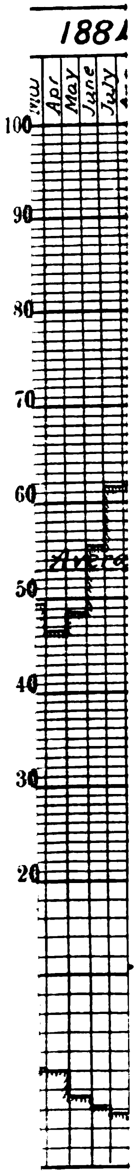

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TABLE V.

SHOWING THE RAINFALL AT THE PUMPING STATION FOR THE YEAR 1887.

Day of the Month.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1.	0.03	0.03	.....	0.16	.....	0.80	.....	0.10	.....	0.53	.....	.....
2.	.....	0.83	.....	0.93	.....	0.38	.....	0.25	.....	0.03	.....	0.01
3.	.....	0 05	.....	.....	.....	0.20	.....	.....	.....	0.08	.....	0.02
4.	0.01	.....	.....	0.04	.....	.....	.....	.....	.....	0.23	.....	.....
5.	0.71	0.04	0.78	.....	.....	.....	.....	.....	.....	.....	.....	0.13
6.	0.38	0.02	0.34	.....	.....	.....	.....	0.18	0.30	.....	.....	.....
7.	.....	0.08	.....	.....	0.12	.....	.....	.....	0.22	.....	.....	.....
8.	.....	0.40	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
9.	0.28	.....	0.31	.....	0.01	.....	0 06	.....	0.21	0.02	.....	.....
10.	.....	0.18	1.05	.....	.....	.....	0.64	.....	.....	0.64	1.16	0.40
11.	.....	0.10	.....	.....	.....	.....	0.54	0.30	.....	0.14	0.01	0.36
12.	.....	.....	.....	.....	.....	.....	.....	.....	0.18	.....	.....	.....
13.	0 50	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
14.	1.05	0.08	.....	.....	.....	.....	.....	.....	.....	.....	0.52	.....
15.	0.01	0.05	0.01	0.23	.....	.....	.....	.....	.....	.....	0.79	0.69
16.	0.05	.....	0.02	0.27	.....	.....	0.70	.....	.....	.....	.....	.....
17.	0.85	.....	0.06	.....	.....	.....	0.03	0.03	.....	.....	.....	0.57
18.	.....	1.75	.....	0.88	.....	.....	0.10	0.36	.....	.....	.....	0.15
19.	.....	.....	0.13	.....	.....	.....	.....	.....	.....	.....	0.13	.....
20.	.....	0.04	0.15	.....	.....	.....	.....	0 68	.....	0.37	.....	0.27
21.	.....	.....	0.05	.....	.....	0.01	.....	1.95	0.16	0.88	.....	0.11
22.	.....	0.10	1 02	.....	.....	0.10	1.46	0.99	0.02	.....	.....	0.02
23.	.....	0.19	.....	0.17	.....	0.75	0.58	0.28	.....	.....	0.03	.....
24.	0.76	0.41	.....	.....	0.03	.....	0.03	0.72	.....	.....	0.18	.....
25.	.....	.....	.....	1.01	0.12	.....	.....	.....	.....	.....	0.13	0.01
26.	0.40	0.63	.....	0.10	0.04	.....	.....	.....	.....	.....	0.01	0 37
27.	.....	.....	0.82	.....	1.15	.....	.....	.....	.....	.....	.....	0.07
28.	.....	.....	0.76	0.70	0.11	.....	.....	.....	.....	.....	0.13	0.62
29.	1.13	.....	.....	0.75	0.03	.....	1.75	.....	0.02	.....	.....	.....
30.	0.04	.....	.....	.....	.....	.....	.....	.....	0.11	.....	.....	.....
31.	.....	.....	.....	.....	0.08	.....	.....	.....	.....	.....	.....	0.25
Totals.	6.20	4.98	5.50	5.24	1.69	2.24	5.89	5.84	1.22	2.92	3.09	4.05

Rainfall for the year, 48.86 inches.

TABLE VI.

SHOWING THE AMOUNT AND SIZE OF PIPE LAID IN 1887.

STREETS WHERE LAID.				SIZE OF PIPE.		
Street.	From	To	Kind of Pipe.	10-in.	6-in.	4-in.
Ashland . .	Extension .	–	Cast-Iron	–	428.0	–
Ames . . .	Summer . .	End of street	"	–	391.7	–
Autumn . .	Extension .	Bloomfield .	"	–	–	40.7
Arthur . .	Summer . .	End of street	"	–	490.5	–
Boston . .	Extension .	St. Jos. Cem'y	"	–	475.5	–
Bickerton .	Granite . .	–	"	–	258.0	–
Belmont ave.	Walnut . .	–	"	–	232.3	–
Collins ave.	Extension .	Boston . .	"	–	225.0	–
Cedar Hill av.	Birch . .	Marianna .	"	–	775.5	–
Cyprus . .	Oak . . .	–	"	–	171.7	–
Columbia ave	Extension .	–	"	–	192.7	–
Etna . . .	Boston . .	End of street	"	–	–	429.0
Eastern ave .	Oakwood av.	–	"	833.3	12.0	–
Forest . .	No. Franklin	Grove . .	"	–	512.5	–
Granite . .	Western ave.	Bickerton .	"	–	198.0	–
Goodridge .	Chestnut .	Clovely . .	"	–	616.0	–
Glenwood .	Extension .	President .	"	–	104.0	–
Hawthorne .	Bay View ave	Allen ave. .	"	–	506.0	–
Hamilton. .	Boston . .	Saugus line .	"	–	181.0	–
Mace . . .	Childs . .	Robinson .	"	–	–	309.0
North Bend .	Collins ave.	–	"	–	733.0	–
Orchard . .	Summer .	–	"	–	428.0	–
Oak . . .	Extension .	Walnut . .	"	–	37.0	–
Oakwood ave.	"	Eastern ave.	"	–	559.4	–
Park . . .	Boston . .	Forest . .	"	–	1,549.0	–
President .	Glenwood .	–	"	–	230.5	–
Rockingham	Extension .	–	"	–	120.0	–
Stetson . .	"	–	"	–	96.0	–
*Summer .	Market . .	Pleasant . .	"	–	11.5	–
Walnut . .	Oak . . .	Belmont ave.	"	-	586.5	–
Totals				833.3	10,121.3	778.7

*720 5 feet 16-inch cast-iron pipe.

TABLE VI.—CONTINUED.

SHOWING THE AMOUNT AND SIZE OF PIPE LAID IN COURTS IN 1887.

COURTS WHERE LAID.			SIZE OF PIPE.				
Court.	From	To	2-in.	1½-in.	1¼-in.	1-in.	¾-in.
Cemetery .	Extension .	–	–	–	406.5	268.0	239.0
Cypress pl. .	Bloomfield .	–	–	106.9	–	–	–
Smith st. .	Extension .	–	138.5	–	–	–	–
Union pl. .	"	–	–	–	74.0	–	–
Totals			138.5	106.9	480.5	268.0	239.0

	Miles.	Feet.
Total extension in 1887	2	2,406
Previously laid	78	3,656
Total pipe laid to January 1, 1888	81	782
Amount laid in Saugus in 1887	7	3,960
Previously laid in Saugus	1	530
Total laid in Saugus	8	4,490
Private pipe in Swampscott		1,778
Total pipe supplied by the works	90	1,779

TABLE VII.

SHOWING THE LOCATION OF GATES SET IN 1887.

Street.	Location.	Size. Inches.
Autumn	17½ ft. W. from the E. line of Autumn st. 1½ ft. S from the S. line of Bloomfield st.	4
Ames	15¾ ft. S. from the N. line of Ames st. 1 ft. W. from the W. line of Summer st.	6
Arthur	17 ft. S. from the N. line of Arthur st. On the line of the W. line of Summer st.	6
Belmont ave.	33½ ft. N. from the S. line of Belmont ave. On the line of the E. line of Walnut st.	6
Collins ave.	16½ ft. W. from the E. line of Collins ave. 1 ft. S. from the S. line of Boston st.	6
Cedar Hill ave.	14 ft. W. from the E. line of Cedar Hill ave. On the line of the N. line of Marianna st.	6
Cypress	12½ ft. E. from the W. line of Cypress st. 3½ ft. N. from the N. line of Oak st.	6
Etna	7 ft. E. from the W. line of Etna st. 1½ ft. N. from the N. line of Boston st.	4
Forest	12½ ft. N. from the S. line of Forest st. On the line of the W. line of No. Franklin st.	6
Granite	18½ ft. E. from the W. line of Granite st. 2 ft. N. from the N. line of Western ave.	6
Goodridge	18 ft. [illegible] from the N. line of Goodridge st. On the line of the E. line of Chestnut st.	6
Glenwood	17 ft. S. from the N. of Glenwood st. On the line of the W. line of President st.	6
Hawthorne	17 ft. E. from the W. line of Hawthorne st. On the line of the N. line of Allen ave.	6
Hawthorne	18 ft. S. from the N. line of Hawthorne st. On the line of the W. line of Bay View ave.	6
Hamilton	15½ ft. W. from the E. line of Hamilton st. 5½ ft. S. from the S. line of building 819 Boston st.	6
Mace	16 ft. S. from the N. line of Mace st. 1 ft. E. from the E. line of Childs st.	4
North Bend	17 ft. W. from the W. line of house No. 51 Boston st. On the line of the N. line of Boston st.	6
Oak	15 ft. N. from the S. line of Oak st. 5 ft. E. from the E. line of Walnut st.	6

TABLE VII.—CONTINUED.

LOCATION OF GATES.—*Continued.*

Street.	Location.	Size. Inches.
Oakwood ave. .	16 ft. S. from the N. line of Oakwood ave. On the line of the W. line of Eastern ave . .	6
Orchard . .	21½ ft. W. from the E. line of Orchard st. 1 ft. S. from the S. line of Summer st. . .	6
Park . . .	17 ft. W. from the E. line of Park st. 4 ft. N. from the N. line of Boston st. . . .	6
Park . . .	24 ft. W. from the E. line of Park st. On the line of the S. line of Forest st. . .	6
President . .	16 ft. W. from the E. line of President st. On the line of the S. line of Glenwood st. .	6
Summer . .	13 ft. S. from the N. line of Summer st. 3½ ft. E. from the hydrant cor. of Pleasant st.	16
*Summer . .	17 ft. S. from the N. line of Summer st. 3 ft. W. from the W. line of Market st. . .	16
Warren . .	16¾ ft. N. from the S. line of Warren st. 2 ft. W. from the W. line of Vine st. . . .	4

SHOWING THE LOCATION OF GATES SET IN COURTS IN 1887.

Court.	Location.	Size. Inches.
Cypress pl. .	9½ ft. W. from the E. line of Cypress pl. On the line of the N. line of Bloomfield st.	1½
Smith-st. ex. .	13½ ft. E. from the W. line of Smith st. On the line of the S. line of School st. . .	2
Smith st . . (Blow off.)	33½ ft W. from the E. line of Smith st. 29 ft. N. from the end of Smith st. . . .	1

Additional gates set in 1887	28
Number previously set	658
Total number of gates set to January 1, 1888 . .	686

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*In place of 12-in. Gate taken out.

TABLE VIII.

SHOWING THE LOCATION OF HYDRANTS SET IN 1887.

STREET.	LOCATION.
Ashland	120 feet north from the railroad.
Ames	350 feet west from Summer street.
Arthur	449 feet west from Summer street.
Bickerton	420 feet north from Western avenue.
Boston	25 feet west from St. Joseph Cemetery gate.
Collins avenue	10 feet south from Boston street.
Cedar Hill avenue	365 feet north from Marianna street.
Etna	400 feet north from Boston street.
Eastern avenue	Corner of Harvest street.
Goodridge	395 feet east from Chestnut street.
Hawthorne	195 feet north from Allen avenue.
North Bend	50 feet east from Boston street.
North Bend	450 feet east from Boston street.
Orchard	380 feet south from Summer street.
Park	435 feet north from Boston street.
Park	875 feet north from Boston street.
Park	164 feet south from Forest street.
Walnut	57 feet south from Belmont avenue.

Number of hydrants set in 1887	18
Number previously set	572
Total number set to Jan. 1, 1888	590
Total number set in Saugus	80

TABLE IX.

SHOWING THE NUMBER, SIZE AND LENGTH OF SERVICES LAID IN 1887.

MONTH.	SIZE AND LENGTH OF PIPE.														Total.	
	6-inch.		4-inch.		2-inch.		1½-inch.		1¼-inch.		1-inch.		¾-inch.			
	No.	Feet.	No.	Feet.	No.	Feet.	No.	Feet.	No.	Feet.	No.	Feet.	No.	Feet.	No.	Feet.
January	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
February	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
March	-	-	-	-	-	-	-	-	-	-	1	27.0	1	27.2	2	54.2
April	-	-	-	-	-	-	2	47.10	1	95.0	11	622.11	35	1,279.10	49	2,045.7
May	-	-	1	46.11	7	604.1	1	14.0	-	-	10	719.4	56	1,777.8	75	3,162.0
June	-	-	-	-	3	31.5	1	15.4	2	253.7	19	1,085.2	30	1,259.11	55	2,645.5
July	-	-	-	-	2	21.1	1	22.3	7	481.4	13	970.7	21	804.1	44	2,299.4
August	-	-	-	-	1	38.10	-	-	4	244.10	21	877.2	29	1,093.7	55	2,254.5
September	-	-	-	-	-	-	-	-	1	51.6	16	694.5	15	396.5	32	1,142.4
October	-	-	-	-	1	33.8	1	34.4	1	16.5	7	572.10	19	830.4	29	1,487.7
November	-	-	-	-	2	249.6	-	-	3	387.0	22	1,522.1	32	1,287.4	59	3,445.11
December	1	38.6	-	-	1	22.3	-	-	1	18.11	7	385.8	21	954.4	31	1,415.8
Totals	1	38.6	1	46.11	17	1,000.10	6	133.9	20	1,548.7	127	7,477.2	259	9,706.8	431	19,952.5

Total services now in use	7,805.	Total length	58 miles, 866 feet.
Total services in Saugus	90.	Total length	2 miles, 3,070 feet.

TABLE X.

SHOWING THE LEAKS ON PIPES, HYDRANTS AND GATES IN 1887.

MONTH.	SIZE OF MAINS.						SIZE OF SERVICES.			Hydrants.
	16	12	10	8	6	4	1½	1	¾	
January	–	–	–	–	1	4	–	1	–	–
February	1	–	–	1	1	1	–	1	2	–
March	–	–	1	–	5	2	–	–	–	1
April	–	–	–	–	3	3	–	–	–	1
May	–	–	–	–	3	2	–	–	–	–
June	–	–	2	–	3	4	–	–	1	1
July	–	–	–	–	6	5	–	–	1	–
August	–	–	2	2	2	3	–	–	–	1
September	–	–	–	2	2	2	–	–	–	4
October	–	–	4	1	3	5	1	–	–	–
November	–	1	2	1	7	4	–	–	–	–
December	–	–	1	–	2	5	–	–	–	2
Totals	1	1	12	7	38	40	1	2	4	10

SUMMARY OF STATISTICS.

REPORT OF 1887.

IN ACCORDANCE WITH SUGGESTIONS ADOPTED BY THE NEW ENGLAND WATER WORKS ASSOCIATION.

LYNN WATER WORKS, LYNN, MASS.

Population by census of 1885	45,861
Date of construction	1870 to 1872

Owned by the City of Lynn.

Source of supply:—Two artificial storage basins, formed by damming two brooks, and the water of two other brooks in North Saugus taken direct.

Mode of supply:—By gravitation to the pump well, and pumped thence to distributing reservoir at an elevation of 177 feet above mean high tide, by one Leavitt engine, built by I. P. Morris & Co., of Philadelphia, of 5,000,000 gallons daily capacity, and one Deane engine, built by the Deane Steam Pump Co., of Holyoke, Mass., of 3,000,000 gallons daily capacity.

The kind of coal used is Clearfield and George's Creek Cumberland.

Cost of coal, first contract, $3.57 per net ton delivered.

Cost of coal, second contract, $4.90 per net ton delivered.

Coal consumed for the year in pounds	1,242,300
Total pumping in gallons	867,711,768
Average head, including friction in feet	167.39
Number of gallons pumped per pound of coal	702.2
Duty on total coal consumed, no deductions	102,059,543
Cost of pumping (figured on pumping station expenses, viz: $6.351.16) per million gallons into the reservoir	$7.31.85
Per million gallons one foot high	$0.04.37

FINANCIAL.

RECEIPTS—	For water for all purposes	$122,142.52
	Summons, shutting of and letting on	245.20
	Rent and sundries	99.78
	Total revenue	$122,487.50
	Labor and material	2,798.94
	Total receipts	$125,286.44
EXPENDITURES—	Management and repairs	$21,952.50
	Interest on bonds	65,981.00
	Total interest and maintenance	$87,933.50
	Carried to credit of construction	2,798.94
	Carried to sinking fund	34,554.00
		$125,286.44

CONSUMPTION.

Estimated population to date	49,500
Estimated population supplied	48,000
Total number of gallons consumed for the year	868,346,338
Total number of gallons metered	84,467,339
Average daily consumption in gallons	2,379,031
Gallons per day to each consumer	49.5
Gallons per day to each service	314

DISTRIBUTION.

Kind of pipe used, wrought-iron cement-lined, and cast-iron.

Size, from 4 to 16 inches diameter.

Extended	12,966 ft.
Total now in use	81 m. 782 ft.
Number of leaks for the year	110
Hydrants added	18
Hydrants now in use	590
Stop gates added	28
Stop gates now in use	686
Range of pressure at center for day and night	55 to 65 lbs.

SERVICES.

Kind of pipe used, wrought-iron cement-lined.

Size of pipe used, ¾ to 2 inches diameter.

Extended	19,952 ft.
Total now in use	58 m. 866 ft.
Number of services added	431
Number of services now in use	7,800
Meters added	16
Meters now in use	236

Meteorological Record for January, 1887.

	8 A. M.		1 P. M.		6 P. M.		24 HOURS ENDING 8 A. M..				
Date.	Barometer.	Thermometer.	Barometer.	Thermometer.	Barometer.	Thermometer.	Maximum Thermometer.	Minimum Thermometer.	Daily range.	Daily mean.	Rainfall.
1	30.13	34°	30.08	36.5°	30.06	35.5°	38°	21°	17°	29.5°	.03
2	29.98	20.5	29.97	21.5	29.99	8	22.5	3	19.5	12.7	–
3	30.03	3	30.06	10	30.09	8	13	–1	14	6	–
4	30.23	2	30.27	20	30.29	17.5	22.5	2	20.5	12.2	.01
5	30.34	22.5	30.34	35	30.33	35	37	22.5	14.5	29.7	.71
6	30.29	27.5	30.25	35	30.23	34.5	36	22	14	29	.38
7	30.20	22	30.22	28	30.22	21.5	28.5	1	27.5	14.7	–
8	30.24	1	30.25	11	30.26	7	12.5	1	11.5	6.7	–
9	30.31	6	30.31	15	30.30	13	17	5.5	11.5	11.2	.28
10	30.26	13	30.26	27	30.24	19.5	28	7	21	17.5	–
11	30.21	9	30.20	21.5	30.20	20	24	9	15	16.5	–
12	30.18	21.5	30.17	33.5	30.17	29.5	33.5	22	11.5	27.7	–
13	30.15	26.5	30.14	34	30.17	31.5	35	27	8	31	.50
14	30.18	31.5	30.15	35	30.13	13.5	35.5	10.5	25	23	1.05
15	30.11	11.5	30.11	17.5	30.10	15	18.5	8	10	13	.01
16	30.10	10.5	30.10	21.5	30.11	20.5	23.5	10.5	13	17	.05
17	30.10	21.5	30.09	34	30.06	31.5	36.5	18	18.5	27.2	.85
18	30.01	18	30.01	19.5	30.01	10.5	21	–5	26	8	–
19	30.04	–3	30.04	13.5	30.04	19	21	–3	24	9	–
20	30.05	18.5	30.05	33	30.04	33	41.5	18.5	23	30	–
21	29.99	41.5	30.02	39	30.06	32.5	42.5	16	26.5	29.2	–
22	30.21	16	30.23	30.5	30.23	39.5	42.5	18	24.5	30.2	–
23	30.20	43	30.08	48.5	30.15	44	48.5	42	6.5	45.2	–
24	30.03	44.5	29.96	49	29.87	38.5	50.5	23.5	27	37	.76
25	29.81	24.5	29.89	36.5	29.89	38	42.5	24.5	18	33.5	–
26	29.87	40	29.88	34.5	29.89	24.5	40	2.5	37.5	21.2	.40
27	30.00	4	30.08	17.5	30.16	20	27	4	23	15.5	–
28	30.31	27	30.31	42.5	30.30	42.5	47.5	27	20.5	37.2	–
29	30.19	47.5	30.10	51.5	30.04	38	51	35.5	15.5	43.2	1.13
30	30.02	36	30.00	38	29.98	38.5	39.5	27.5	12	33.5	.04
31	29.95	27.5	29.99	28	30.03	28	30.5	17.5	13	24	–

Monthly range	56°
Monthly mean	23.29°
Monthly rainfall	6.20

Meteorological Record for February, 1887.

	8 A. M.		1 P. M.		6 P. M.		24 HOURS ENDING 8 A. M.				
Date.	Barometer.	Thermometer.	Barometer.	Thermometer.	Barometer.	Thermometer.	Maximum Thermometer.	Minimum Thermometer.	Daily range.	Daily mean.	Rainfall.
1	30.10	17.5°	30.17	24°	30.24	20.5°	25°	17.5°	7.5°	21.2°	.03
2	30.41	18	30.44	22.5	30.45	23	26.5	9	17.5	17.7	.83
3	30.45	13	30.44	21.5	30.41	23.5	32.5	12.5	20	22.5	.05
4	30.36	28.5	30.36	28.5	30.38	23	29	4.5	24.5	16.7	–
5	30.43	5.5	30 46	20.5	30.47	21.5	25	5.5	19.5	15.2	.04
6	30.49	24.5	30.48	36.5	30.45	37	38.5	26.5	12	32.5	.02
7	30.41	27.5	30.42	27	30.43	26.5	32.5	26.5	6	29.5	.08
8	30.44	32.5	30.42	36.5	30.38	37	41.5	33	8.5	37.2	.40
9	30.29	39	30.27	37.5	30.27	32.5	40	22	18	31	–
10	30.29	24	30.29	37	30.28	34.5	44	26	18	35	.18
11	30.18	42.5	30.13	36	30.09	32.5	44	9	35	26.5	.10
12	30.05	14.5	30.09	20 5	30.10	20	22.5	8	14.5	15.2	–
13	30.21	10	30.24	14.5	30.28	15	17.5	5	12	11	–
14	30.39	8	30.42	22.5	30.44	26	37	8	29	22.5	.08
15	30.43	37	30.37	44	30.32	42	45.5	37.5	8	41.5	.05
16	30.21	39	30.18	45.5	30.14	39.5	46.5	35.5	11	41	–
17	30.09	36	30.09	39	30.09	36.5	40.5	26	14.5	33.2	–
18	30.14	30.5	30.15	33.5	30.12	35	44	31.5	12.5	37.7	1.75
19	30.04	37	30.02	43.5	30.02	40	44	28	16	36	–
20	30.07	28.5	30.09	34.5	30.11	33	35	27.5	7.5	31.2	0.4
21	30.19	27.5	30.24	32	30.27	32.5	36	28	8	32	–
22	30.34	32.5	30.33	35.5	30.33	34	37.5	24.5	13	31	.10
23	30 33	26.5	30.35	34	30 35	32.5	35.5	27	8.5	31.2	.19
24	30.32	33.5	30.25	40.5	30.20	36	44.5	15	29.5	29.7	.41
25	30.17	15	30.18	20.5	30.20	19.5	23	13	10	18	–
26	30.24	16.5	30.26	26.5	30.25	28.5	40.5	17	23.5	28.7	.63
27	30.11	36.5	30.09	36.5	30.08	28	37.5	14	23.5	25.7	–
28	30.06	14	30.05	22	30.05	17	23	10	13	16.5	–

Monthly range	40.5°		
Monthly mean		27.42°	
Monthly rainfall			4.98

Meteorological Record for March, 1887.

	8 A. M.		1 P. M.		6 P. M.		24 HOURS ENDING 8 A. M.				
Date.	Barometer.	Thermometer.	Barometer.	Thermometer.	Barometer.	Thermometer.	Maximum Thermometer.	Minimum Thermometer.	Daily range.	Daily mean.	Rainfall.
1	30.07	14°	30.07	23°	30.08	22.5°	26.5°	14.5°	12°	20.5°	-
2	30.09	26.5	30.08	39	30.06	41	41.5	26	15.5	33.7	-
3	30.07	26	30.12	30	30.14	27	30.5	20.5	10	25.5	-
4	30.20	22	30.23	32	30.25	31	36	9	27	22.5	-
5	30.31	11.5	30.40	22	30.44	20.5	28	12.5	15.5	20.2	.78
6	30.46	27.5	30.45	32.5	30.41	33.5	33	25	8	29	.34
7	30.33	26.5	30.31	32	30.30	32	34.5	30.5	4	32.5	-
8	30.26	33.5	30.27	44	30.28	36	44	20.5	23.5	32.2	-
9	30.30	25.5	30.31	35	30.30	35	37	26	11	31.5	.31
10	30.24	37	30.21	35	30.18	34	38	25	13	31.5	1.05
11	30.12	25	30.11	28.5	30.11	24	29.5	23.5	6	26.5	-
12	30.09	27.5	30.08	38	30.08	37	40.5	28.5	12	34.5	-
13	30.08	36.5	30.08	43.5	30.07	40	44	29.5	14.5	36.7	-
14	30.03	34	30.03	45.5	30.05	43.5	47	19.5	27.5	33.2	-
15	29.99	21.5	29.99	31	29.98	28	33.5	21.5	12	27.5	.01
16	29.97	23.5	29.97	36	29.96	33.5	37	21.5	15.5	29.2	.02
17	29.95	29	29.95	40.5	29.94	35.5	43	30	13	36.5	.06
18	29.92	33	29.91	42	29.90	38.5	43	34	9	38.5	-
19	29.84	36.5	29.83	40.5	29.82	40	43	34.5	8.5	38.7	.13
20	29.88	37	29.91	39.5	29.93	36.5	41	30.5	10.5	35.7	.15
21	29.94	34.5	29.96	42.5	29.96	42	46	34	12	40	.05
22	29.90	34	29.85	38.5	29.80	36.5	39	27	12	33	1.02
23	29.75	27	29.74	28	29.74	28.5	31	20.5	10.5	25.7	-
24	29.76	25	29.78	35.5	29.79	38	45	26	19	35.5	-
25	29.75	44	29.74	39.5	29.75	31.5	44	26	18	35	-
26	29.85	26.5	29.88	30	29.91	28.5	31	19.5	11.5	25.2	-
27	30.03	22.5	30.05	34.5	30.08	33	36	23.5	12.5	29.7	.82
28	30.04	35	29.97	43	29.91	39	45	25.5	19.5	35.2	.76
29	29.80	25.5	29.79	30	29.81	26	30.5	13.5	17	22	-
30	29.79	15.5	29.81	26.5	29.82	28	29.5	15.5	14	22.5	-
31	29.93	25.5	30.00	39	30.03	37	42	25.5	16.5	33.7	-

Monthly range	38°
Monthly mean	30.78°
Monthly rainfall	5.50

Meteorological Record for April, 1887.

	8 A. M.		I P. M.		6 P. M.		24 HOURS ENDING 8 A. M.				
Date.	Barometer.	Thermometer.	Barometer.	Thermometer.	Barometer.	Thermometer.	Maximum Thermometer.	Minimum Thermometer.	Daily range.	Daily mean.	Rainfall.
1	30.11	35.5°	30.13	37°	30.13	34°	37.5°	31°	6.5°	34.2°	.16
2	30.10	31	30.04	27	30.01	29	37	27.5	9.5	32.2	.93
3	29.96	37	29.96	47.5	29.97	44.5	50	37.5	12.5	43.7	–
4	29.97	40.5	29.95	57.5	29.92	42.5	57	33	24	45	.04
5	29.87	39.5	29 87	48	29.87	35.5	48	23	25	35.5	–
6	29.89	25	29.91	34	29.94	35.5	48	23.5	24.5	35.7	–
7	30.03	33	30 07	37	30.11	36	38 5	24.5	14	31.5	–
8	30.22	32.5	30.30	42.5	30 33	39	42.5	32	10.5	37.2	–
9	30.34	41.5	30.34	59.5	30.32	58.5	61.5	43	18.5	52.2	–
10	30.21	58	30.17	73.5	30.13	72.5	76	50.5	25.5	63.2	–
11	30.06	57.5	30 03	72	30.02	57.5	71.5	34	37.5	52.7	–
12	30.14	39	30.17	39.5	30.18	38	41.5	32.5	9	37	–
13	30.26	35	30.27	42	30.27	39.5	44	30	14	37	–
14	30.28	36.5	30.28	43.5	30.26	41.5	45	30.5	14.5	37.7	–
15	30.25	37.5	30.24	40.5	30.22	39	43	36.5	6.5	39.7	.23
16	30.16	36.5	30.10	40.5	30.04	38.5	41	36	5	38.5	.27
17	29.99	36.5	29.98	44.5	29.98	39.5	39.5	25	14.5	32.2	–
18	29.98	30.5	29.98	28.5	29.97	26.5	34	26.5	7.5	30.2	.88
19	29 92	33	29.92	41	29.92	45.5	45	32	13	38.5	–
20	29 96	41.5	29.98	54	29.99	52	53	36.5	16.5	44.7	–
21	30.01	45.5	30.04	47	30.05	47	53	42.5	10.5	47.7	–
22	30.11	52.5	30.13	54.5	30.13	50	56.5	40	16.5	48.2	–
23	30.11	49	30.10	50	30.07	47	54	43	11	48.5	.17
24	29.97	47	29.95	59	29.95	46	59.5	39.5	20	49.5	–
25	30.00	47	32.00	49	30.01	50	51.5	36	15.5	43.7	1 01
26	29.92	36.5	29.88	46.5	29.88	52.5	53	35	18	44	.10
27	29.90	47.5	29.91	55	29.92	53	55.5	40.5	15	48	–
28	29.93	46.5	29.92	54.5	29.88	44	55	44	11	49.5	.70
29	29.71	50	29.64	50.5	29.57	48.5	51.5	46.5	5	49	.75
30	29.43	51.5	29.44	55	29.47	51	56.5	44.5	12	50.5	–

Monthly range	53°		
Monthly mean		42.6°	
Monthly rainfall			5.24

Meteorological Record for May, 1887.

	8 A. M.		1 P. M.		6 P. M.		24 HOURS ENDING 8 A. M.				
Date.	Barometer.	Thermometer.	Barometer.	Thermometer.	Barometer.	Thermometer.	Maximum Thermometer.	Minimum Thermometer.	Daily range.	Daily mean.	Rainfall.
1	29.61	49.5°	29.68	60°	29.77	62.5°	64°	45.5°	18.5°	54.7°	–
2	30.02	57	30.13	54.5	30.19	50	57	45.5	11.5	51 2	–
3	30.30	52	30.31	57	30.30	59.5	62	51.5	10.5	56.7	–
4	30.22	62	30.12	74.5	30.02	76.5	77.5	54	23.5	65.7	–
5	30.05	62.5	30 07	66	30.06	56	66.5	48.5	18	57.5	–
6	30.14	56.5	30.18	57	30.21	51	58	47.5	10.5	52.7	–
7	30.31	50	30.33	51.5	30.33	47.5	52	46.5	5.5	49.2	.12
8	30.33	52	30.32	55	30.29	51	62.5	49	13.5	55.7	.01
9	30.25	62.5	30.27	63	30.29	53	63.5	46.5	17	55	–
10	30.30	59	30.26	78.5	30.18	72	80.5	59	21.5	69.7	–
11	30.12	66.5	30.12	73	30.11	71	73	54.5	18.5	63.7	–
12	30.11	60	30.10	67	30.10	64.5	66	43	23	54.5	–
13	30.10	53.5	30.10	50.5	30.12	50	55	41	14	48	–
14	30.18	54	30.22	54.5	30.24	53.5	56.5	44.5	12	50.5	–
15	30.27	55	30.28	57	30.28	56	60	45	15	52.5	–
16	30.26	54	30.25	57	30.23	54	59.5	45.5	14	52.5	–
17	30.16	55.5	30.14	58.5	30.11	57.5	62	49	13	55.5	–
18	30.02	54	30.00	56.5	29.98	54 5	62.5	49	13.5	55.7	–
19	30.00	60	30.01	72.5	30.01	67	72.5	56.5	16	64.5	–
20	30.07	67.5	30 09	75.5	30.08	76.5	80.5	55	25.5	67.7	–
21	30.15	59	30.20	63.5	30.22	59	63.5	52.5	11	58	–
22	30.27	60	30.28	66.5	30.26	65	68.5	55	13.5	61.7	–
23	30.15	68.5	30.10	82	30.06	76	82	62	20	72	–
24	30.01	71	29.98	74.5	29.93	73	76.5	62.5	14	69.5	.03
25	29.87	65.5	29.82	68.5	29 74	69	71	61	10	66	.12
26	29.70	65.5	29.70	66	29.65	70	70	55	15	62.5	.04
27	29 68	59.5	29.89	63	29.71	53	65.5	46.5	19	56	1.15
28	29.76	47.5	29.80	48	29.83	48.5	48.5	46.5	2	47.5	.11
29	29.89	48	29.91	48.5	29.93	47.5	53	47.5	5.5	50.2	.03
30	30.01	53	30.09	55	30.15	56.5	56 5	51	5 5	53.7	–
31	30.29	57	30.34	56.5	30.36	53.5	58	47.5	10.5	52.7	.08

Monthly range . . . . 41°
Monthly mean . . . . 57.54°
Monthly rainfall 1.69

Meteorological Record for June, 1887.

	8 A. M.		1 P. M.		6 P. M.		24 HOURS ENDING 8 A. M.				
Date.	Barometer.	Thermometer.	Barometer.	Thermometer.	Barometer.	Thermometer.	Maximum Thermometer.	Minimum Thermometer.	Daily range.	Daily mean.	Rainfall.
1	30.36	49°	30.34	53°	30.28	55°	57.5°	48.5°	9°	53°	.80
2	30.18	57.5	30.12	64.5	30.01	61	66.5	56	10.5	61.2	.38
3	29.85	62.5	29.78	71.5	29.78	72	72	52	20	62	.20
4	29.86	55	29.94	58	30.03	51.5	57	48.5	8.5	52.7	–
5	30.21	56.5	30.24	57.5	30.25	55	62	52	10	57	–
6	30.26	62	30.24	74	30.22	72	75	57	18	66	–
7	30.14	68.5	30.10	74.5	30.07	70.5	75.5	56	19.5	65.7	–
8	30.06	66	30.01	72	29.90	72	73	62.5	10.5	67.7	–
9	29.72	73	29.74	62.5	29.79	57.5	78	52	26	65	–
10	29.97	60	30.06	58	30.10	56	61.5	45.5	16	53.5	–
11	30.23	57.5	30.25	63	30.27	60.5	64.5	48	16.5	56.2	–
12	30.28	61.5	30.28	65.5	30.26	62.5	69.5	52.5	17	61	–
13	30.14	69.5	30.06	72.5	29.99	75	78	59	19	68.5	–
14	30.04	59.5	30.13	60	30.16	58.5	60	47	13	53.5	–
15	30.23	58.5	30.24	61.5	30.23	61	62	51	11	56.5	–
16	30.13	62	29.99	76	29.85	76.5	78	62.5	15.5	70.2	–
17	29.79	73	29.80	68.5	29.78	69	74	60.5	13.5	67.2	–
18	29.77	64.5	29.79	61.5	29.79	60.5	66.5	57	9.5	61.7	–
19	29.81	66	29.81	68.5	29.81	68.5	76	60.5	15.5	68.2	–
20	29.86	68.5	29.95	67	29.99	59.5	73.5	57	16.5	65.2	–
21	30.06	58.5	30.06	62.5	30.01	60	66.5	58	8.5	62.2	.01
22	29.91	66.5	29.89	72	29.86	71.5	73.5	65.5	8	69.5	.10
23	29.91	70	29.94	72.5	29.95	68	74	59	15	66.5	.75
24	29.90	67	29.94	76	29.96	77.5	79.5	62	17.5	70.7	–
25	30.13	63.5	30.16	73	30.16	72.5	73	57	16	65	–
26	30.24	67.5	30.26	69	30.26	69	71.5	55.5	16	63.5	–
27	30.29	67	30.30	70	30.30	68	70	57.5	12.5	63.7	–
28	30.31	69.5	30.31	73.5	30.29	71	74	61.5	12.5	67.7	–
29	30.28	74	30.27	80	30.24	77	81	65.5	15.5	73.2	–
30	30.23	77	30.21	82	30.18	81.5	83	67.5	15.5	75.2	–

Monthly range	37.5°
Monthly mean	63.66°
Monthly rainfall	2.24

Meteorological Record for July, 1887.

	8 A. M.		1 P. M.		6 P. M.		24 HOURS ENDING 8 A. M.				
Date.	Barometer.	Thermometer.	Barometer.	Thermometer.	Barometer.	Thermometer.	Maximum Thermometer.	Minimum Thermometer.	Daily range.	Daily mean.	Rainfall.
1	30.17	79°	30.17	89°	30.13	84°	89°	71°	18°	80°	-
2	30.13	79	30.10	88.5	30.06	82	89	71.5	17.5	80.2	-
3	30.14	80	30.15	87.5	30.17	73.5	86.5	69	17.5	77.7	-
4	30.23	78	30.23	84.5	30.22	84	86	67	19	76.5	-
5	30.27	76	30.27	81	30.26	83	81.5	65	16.5	73.2	-
6	30.10	73	30.06	79	30.01	76	81	70.5	10 5	75.7	-
7	29.95	76	29.91	82.5	29.88	84	84	69	15	76.5	-
8	29.93	78	29.94	77	29.93	72.5	79	66	13	72.5	-
9	29.93	69	29.93	70	29.91	68	73.5	62.5	11	68	.06
10	29.76	64.5	29.68	76	29.65	73.5	77	63	14	70	.64
11	29.67	68	29.71	71.5	29.81	67	73.5	64	9.5	68.7	.54
12	30.02	66.5	30.04	70 5	30.04	66	75	62 5	12.5	68.7	-
13	30.00	75	29.97	87.5	29.92	82	88	69.5	18.5	78.7	-
14	29.99	71	30.00	74	30.00	73.5	76.5	59	17.5	67.7	-
15	30.01	68.5	30.02	74	30.02	72	75	60.5	14.5	67.7	-
16	30.02	67.5	29.99	75	29.93	75	77	68	9	72.5	.70
17	29.94	72.5	29.96	75	29.93	68.5	74	66	8	70	.03
18	29.89	71	29.90	65.5	29.96	67	69.5	60	9.5	64.7	.10
19	30.10	69.5	30.15	74.5	30.07	68.5	74.5	64	10.5	69.2	-
20	30.24	68.5	30.24	69	30 22	69	70	60	10	65	-
21	30.21	65	30.20	68	30.14	68	71.5	63.5	8	67.5	-
22	30.05	64.5	30.02	68	29.97	71	71.5	63.5	8	67.5	1.46
23	30.05	70.5	30.04	78	30.08	73	77.5	68	9.5	72.7	.58
24	30.17	77.5	30.22	80.5	30.21	78	81	69	12	75	.03
25	30.24	76.5	30.21	77	30.17	78.5	80.5	67	13.5	73.7	-
26	30.13	73.5	30.11	78	30.08	73	80	65.5	14.5	72.7	-
27	30.07	73	30.07	74	30.07	66.5	77.5	62	15.5	69.7	-
28	30.07	71	30.05	73.5	30.01	76.5	77	68.5	8.5	72.7	-
29	30.03	74	30.04	79	30.03	76.5	80	66.5	13.5	73.2	1.75
30	30.07	71	30.11	77	30.05	76	79.5	70.5	9	75	-
31	29.99	79.5	29.99	81	29.88	80	85	67	18	76	-

Monthly range . . . . 30°
Monthly mean 72.25
Monthly rainfall 5.89

Meteorological Record for August, 1887.

	8 A. M.		1 P. M.		6 P. M.		24 HOURS ENDING 8 A. M.				
Date.	Barometer.	Thermometer.	Barometer.	Thermometer.	Barometer.	Thermometer.	Maximum Thermometer.	Minimum Thermometer.	Daily range.	Daily mean.	Rainfall.
1	30.00	75°	30.01	79.5°	30.00	75°	79.5°	68°	11.5°	73.7°	.10
2	30.02	69	30.04	71	30.04	69	72	65	7	68.5	.25
3	30.11	70	30.17	73	30.19	71.5	74	63	11	68.5	-
4	30.26	68.5	30.28	73.5	30.25	70	75	63.5	11.5	69.2	-
5	30.20	68	30.16	73	30.09	73	73	68	5	70.5	-
6	29.92	74	29.83	79	29.82	71	79.5	62	17.5	70.7	.18
7	29.97	64	30.00	69	30.03	69.5	70.5	51	19.5	60.7	-
8	30.13	61.5	30.18	67.5	30.21	67.5	68.5	65	3.5	66.7	-
9	30.26	64.5	30.27	71.5	30.25	69.5	68.5	67	1.5	67.7	-
10	30.18	68	30.12	77.5	30.08	72	69.5	64.5	5	67	-
11	30.04	70.5	29.99	76.5	29.95	72	76.5	68	8.5	72.2	.30
12	29.88	72.5	29.84	82	29.84	78	83	55	28	69	-
13	30.03	59.5	30.03	65	30.04	67	67	52	15	59.5	-
14	30.07	61	30.07	71.5	30.06	68	73	67	6	70	-
15	30.02	66	29.96	72	29.92	71	73	61	12	67	-
16	29.88	68	29.85	72.5	29.82	72	73.5	60.5	13	67	-
17	29.93	65.5	29.96	70.5	29.98	66.5	72	64 5	7.5	68.2	.03
18	29.86	64.5	29.74	71	29.67	73	73.5	61.5	12	67.5	.36
19	29.87	69	29.90	78.5	29.90	77.5	80.5	62	18.5	71.2	-
20	30.03	66.5	30.05	63	30.02	62.5	68.5	56.5	12	62.5	.68
21	29.98	63	30.01	74	30.02	71.5	73.5	66	7.5	69.7	1.95
22	29.99	65	29.88	73	29.85	68.5	74	59.5	14.5	66.7	.99
23	29.84	61	29.85	59.5	29 86	58.5	60.5	57.5	3	59	.28
24	29.91	59	29.88	62	29.85	60	63.5	58.5	5	61	.72
25	29.85	62	29.85	68.5	29.86	65.5	69	49	20	59	-
26	29.86	57.5	29.86	66	29.87	64.5	67	50.5	16.5	58.7	-
27	29.95	59.5	29.97	69.5	29.97	67	69.5	53.5	16	61.5	-
28	30.00	60	30.01	65.5	30.02	63.5	65.5	52	13.5	58.7	-
29	30.05	59.5	30.07	65	30.08	63	65.5	51.5	14	58.5	-
30	30.14	58.5	30.20	66	30.22	61	66	51.5	14.5	58.7	-
31	30.30	57	30.33	62	30.33	60	63	47.5	15.5	55.2	-

Monthly range	35.5°
Monthly mean	65.31
Monthly rainfall	5.84

Meteorological Record for September, 1887.

	8 A. M.		1 P. M.		6 P. M.		24 HOURS ENDING 8 A. M.				
Date.	Barometer.	Thermometer.	Barometer.	Thermometer.	Barometer.	Thermometer.	Maximum Thermometer.	Minimum Thermometer.	Daily range.	Daily mean.	Rainfall.
1	30.31	56°	30.29	65°	30.26	62.5°	65.5°	47.5°	18°	56.5°	-
2	30.11	61	30.03	71.5	29.94	66.5	72	57.5	14.5	64.7	-
3	29.89	62	29.91	66.5	29.94	63	66.5	55.5	11	61	-
4	30.11	63	30.17	69	30.21	65	69	53	16	61	-
5	30.27	63	30.26	71.5	30.24	67	72	65	7	68.5	-
6	30.13	63	30.08	75.5	30.01	71	75.5	63.5	12	69.5	.30
7	29.90	67.5	29.66	77	29.59	71.5	77.5	57.5	20	67.5	.22
8	29.72	61.5	29.76	63	29.79	60	64	47.5	16.5	55.7	-
9	29.98	56.5	30.02	64	30.04	63	65.5	57	8.5	61.2	.21
10	30.04	62.5	30.08	71	30.11	65	73	47	26	60	-
11	30.28	52	30.32	57	30.34	53.5	57	47.5	9.5	52.2	-
12	30.35	57	30.35	57	30.32	56	59	54.5	4.5	56.7	.18
13	30.20	59	30.18	63.5	30.17	61.5	64	58	6	61	-
14	30.14	61.5	30.13	70	30.09	70	70.5	56.5	14	63.5	-
15	30.11	59.5	30.12	71.5	30.10	66	72	52	20	62	-
16	30.12	55	30.13	61.5	30.14	54.5	62	41.5	20.5	51.7	-
17	30.22	49.5	30.24	58	30.26	55.5	58	44	14	51	-
18	30.32	52	30.34	61	30.35	59	62.5	48	14.5	55.2	-
19	30.34	56.5	30.30	69.5	30.22	67.5	71.5	41.5	30	56.5	-
20	30.26	51	30.28	61.5	30.29	56	62.5	43.5	19	53	-
21	30.29	52	30.25	70.5	30.20	65	71.5	52.5	19	62	.16
22	29.94	63.5	29.85	67	29.84	61	68.5	50.5	18	59.5	.02
23	29.84	51.5	29.85	56	29.86	50	57.5	38.5	19	48	-
24	29.93	43	29.95	51	29.97	50	51	44.5	6.5	47.7	-
25	29.98	49	29.98	56.5	29.99	50.5	56	38.5	17.5	37.2	-
26	29.99	43	29.99	55	29.99	53.5	57	36.5	20.5	46.7	-
27	30.01	41	30.02	51.5	30.03	50	52.5	42	10.5	47.2	-
28	30.06	51	30.09	65	30.10	61	66.5	51	15.5	58.7	-
29	30.13	58.5	30.15	61	30.13	58.5	62.5	54.5	8	58.5	.02
30	30.12	57	30.15	60	30.16	54	61	53.5	7.5	57.2	.11

Monthly range . . . . 41°

Monthly mean . . . . 57.39°

Monthly rainfall 1.22

Meteorological Record for October, 1887.

.	8 A. M.		1 P. M.		6 P. M.		24 HOURS ENDING 8 A. M.				
Date.	Barometer.	Thermometer.	Barometer.	Thermometer.	Barometer.	Thermometer.	Maximum Thermometer.	Minimum Thermometer.	Daily range.	Daily mean.	Rainfall.
1	30.17	55.5°	30.15	57°	30.06	57°	57.5°	56°	1.5°	56.7°	.53
2	29.95	57.5	29.94	62.5	29.91	60	67	51	16	59	.03
3	29.87	56	29.82	65	29.78	58.5	66	50.5	15.5	58.2	.08
4	29.70	51.5	29.67	59	29.64	59.5	64	47.5	16.5	55.7	.23
5	29.65	51.5	29.67	58	29.70	56	59	45	14	52	-
6	29.78	50	29.82	62.5	29.85	58	63	50	13	56.5	-
7	29.94	57.5	29.97	68.5	29.98	65	69.5	47.5	22	58.5	-
8	30.03	51	30.04	63.5	30 03	60	66	52	14	59	-
9	30.02	56	30.02	59.5	30.00	57	59.5	54.5	5	57	.02
10	29.95	58	29.93	62.5	29.89	61	65	49.5	15.5	57.2	.64
11	29.76	50	29.76	47.5	29.76	46.5	50	38.5	11.5	44.2	.14
12	29.79	42	29.81	49.5	29.82	44.5	50	36	14	43	-
13	29.88	43	29.89	60	29.89	54	60	42.5	17.5	51.2	-
14	29.90	46.5	29.91	52	29.91	48	53	31	22	42	-
15	29.96	36.5	29.99	45	30.01	42	47	31.5	15.5	39.2	-
16	30.07	40	30.09	56.5	30.09	51.5	58	40.5	17.5	49.2	-
17	30.10	47.5	30.11	66	30.12	57.5	66	47.5	18.5	56.7	-
18	30.09	58.5	30.05	68.5	30.03	59.5	68.5	45	23.5	56.7	-
19	30.02	47	30.03	50	30.03	48.5	51	37	14	44	-
20	30.05	41.5	30.06	51	30.06	48.5	51.5	42	9.5	46.7	.37
21	29.97	46	29.91	46	29.87	47	49	37	12	43	.88
22	29.82	40	29.83	46.5	29.84	42	47	35	12	41	-
23	29.94	38	29.96	48	29.97	46.5	58.5	38	20.5	48.2	-
24	29.96	58.5	29.93	65	29.94	49.5	66	38.5	27.5	52.2	-
25	30.03	40	30.06	47.5	30.09	46	47	29.5	17.5	38.2	-
26	30.15	34.5	30.17	40	30.20	39.5	42	38	4	40	-
27	30.29	36.5	30.30	45.5	30.31	43.5	46	37	9	41.5	-
28	30.32	43.5	30.32	50.5	30.31	47.5	50.5	38	12.5	44.2	-
29	30.27	43.5	30.25	50	30.21	49.5	51	40	11	45.5	-
30	30.09	41	30.09	41	30.09	39	42.5	26	16.5	34.2	-
31	30.08	29.5	30.09	41	30.08	41	43	31	12	37	-

Monthly range	43.5°
Monthly mean	48.66°
Monthly rainfall	2.92

Meteorological Record for November, 1887.

	8 A. M.		1 P. M.		6 P. M.		24 HOURS ENDING 8 A. M.				
Date.	Barometer.	Thermometer.	Barometer.	Thermometer.	Barometer.	Thermometer.	Maximum Thermometer.	Minimum Thermometer.	Daily range.	Daily mean.	Rainfall.
1	30.07	36.5°	30.07	37°	30.08	35.5°	38°	27°	11°	32.5°	–
2	30.08	31.5	30.08	45	30.07	43	47	43.5	3.5	45.2	–
3	30.06	43.5	30.06	51.5	30.07	46.5	54	42	12	48	–
4	30.05	48.5	30.01	59	29.98	56.5	59.5	31.5	28	45.5	–
5	29.95	32.5	29.96	35.5	29.97	31.5	36.5	27	9.5	31.7	–
6	30.03	33.5	30.03	47	30.03	45	47	33.5	13.5	40.2	–
7	30.02	44.5	30.02	62	30.01	56	62.5	44.5	18	53.5	–
8	29.99	47	29.99	59.5	30.01	43	60	25	35	42.5	–
9	30.02	26.5	30.04	41	30.05	38	42.5	26.5	16	34.5	–
10	30.06	30	30.04	45.5	30.03	45.5	49.5	35	14.5	42.2	1.16
11	29.80	41	29.79	42	29.78	38	42	34	8	38	.01
12	29.77	36.5	29.77	41.5	29.76	35	41.5	32	9.5	36.7	–
13	29.78	35	29.79	44	29.81	39	44.5	31.5	13	38	–
14	29.85	34.5	29.90	43.5	29.92	43	48.5	36.5	12	42.5	.52
15	29.90	48.5	29.83	53	29.79	45	53.5	35.5	18	44.5	.79
16	29.73	38	29.73	43	29.73	38.5	43	36	7	39.5	–
17	29.73	39.5	29.73	50	29.73	44.5	51	32.5	18.5	41.7	–
18	29.77	34	29.80	44.5	29.83	39.5	45.5	29.5	16	37.5	–
19	29.88	42	29.88	46	29.83	47.5	51	43.5	7.5	47.2	.13
20	29.73	44.5	29.71	48.5	29.71	42	48.5	25.5	23	37	–
21	29.73	26.5	29.75	35	29.78	34.5	36.5	27	9.5	31.7	–
22	29.87	29	29.92	41	29.94	39.5	41.5	30	11.5	35.7	–
23	30.06	37.5	30.07	48.5	30.18	45.5	48	38.5	9.5	43.2	.03
24	30.13	40	30.16	38.5	30.17	37.5	41	37	4	39	.18
25	30.21	41	30.23	35	30.23	34	44	34	10	39	.13
26	30.25	39.5	30.25	49	30.23	48	52	40	12	46	.01
27	30.29	42	30.29	52.5	30.29	52.5	55.5	42.5	13	49	–
28	30.25	54.5	30 20	55	30.21	43.5	62.5	27	35.5	44.7	.13
29	30.28	27	30.30	31	30.31	27	32	20.5	11.5	26.2	–
30	30.33	21	30.34	26	30.35	19.5	27.5	5.5	22	16.5	–

Monthly range . . . . 57°
Monthly mean . . . . 39.66°
Monthly rainfall 3.09

Meteorological Record for December, 1887.

	8 A. M.		1 P. M.		6 P. M.		24 HOURS ENDING 8 A. M.				
Date.	Barometer.	Thermometer.	Barometer.	Thermometer.	Barometer.	Thermometer.	Maximum Thermometer.	Minimum Thermometer.	Daily range.	Daily mean.	Rainfall.
1	30.37	7°	30.38	18°	30.39	18°	19.5°	7°	12.5°	13.2°	-
2	30.40	16	30.40	26.5	30.40	28.5	37	17	20	27	.01
3	30.40	37	30.40	44.5	30.40	41	46	33	13	39.5	.02
4	30.43	36	30.42	41.5	30.42	42	41.5	36.5	5	39	-
5	30.37	41.5	30.35	45	30.32	40.5	46	29	17	37.5	.13
6	30.28	29.5	30.28	39	30.28	38.5	41	28.5	12.5	34.7	-
7	30.29	30.5	30.29	38.5	30.29	38.5	41	31.5	9.5	36.2	-
8	30.28	37.5	30.28	44	30.28	36	44	31	13	37.5	-
9	30.30	33	30.33	34.5	30.34	33	37.5	31	6.5	34.2	-
10	30.36	36	30.36	43	30.36	44	51	38.5	12.5	44.7	.40
11	30.30	51.5	30.27	54.5	30.21	51	55	44.5	10.5	49.7	.36
12	30.07	46	30.02	55.5	29.89	46	56	32.5	23.5	44.2	-
13	30.05	32.5	30.06	41	30.07	38.5	41.5	32	9.5	36.7	-
14	30.18	32	30.19	42.5	30.20	40	42.5	33.5	9	38	-
15	30.19	38.5	30.16	44.5	30.13	41.5	45.5	33.5	12	39.5	.69
16	30.07	33.5	30.06	33	30.06	28.5	33.5	25	8.5	29 2	-
17	30.05	25	30.04	38.5	30.04	47.5	40.5	27	13.5	33.7	.57
18	30.02	35.5	30.02	31.5	30.01	31.5	35.5	29	6.5	32.2	.15
19	29.99	31.5	29.98	35.5	29.99	32	36	27.5	8.5	31.7	-
20	30.00	28.5	30.01	43	30.02	40	44	29.5	14.5	36.7	.27
21	30.01	33	29.99	36	29.98	35	37	28.5	8.5	32.7	.11
22	29.97	29.5	29.97	33	29.96	21	35	11.5	23.5	23.2	.02
23	29.96	14	29.97	23	29.97	21	25.5	14	11.5	19.7	-
24	29.98	15.5	29.97	33	29.97	28.5	33.5	16	17.5	24.7	-
25	29.97	27	29.97	26.5	29.97	25.5	27	20	7	23.5	.01
26	29 98	20.5	29.98	25	29.99	22	26.5	15	11.5	20.7	.37
27	29.99	15	30.00	22.5	30.05	20.5	33.5	15	18.5	24.2	.07
28	30.04	33.5	30.02	38.5	29.99	42	44.5	21	23.5	32.7	.62
29	29.95	21.5	29.95	23	29.95	14	24.5	7.5	17	16	-
30	29.96	7.5	29.97	11.5	29 98	10.5	15	5	10	10	-
31	30.01	6	30.05	15.5	30.05	18	34.5	6	28.5	20.2	.25

Monthly range	51°
Monthly mean	31.09°
Monthly rainfall	4.05

1912

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SEVENTEENTH ANNUAL REPORT

OF THE

PUBLIC WATER BOARD

OF THE

CITY OF LYNN,

FOR THE YEAR ENDING DECEMBER 31, 1888.

LYNN, MASS.:
WHITTEN & CASS, PRINTERS,
33 MUNROE STREET.
1889.

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WHITTEN & CASS, PRINTERS,
33 MUNROE STREET.
1889.

R. L. M.

OFFICERS FOR 1888.

D. H. Sweetser, *President*,
For one year.

Alfred A. Mower,
For two years.

David Knox,
For three years.

Edwin Bates,
For four years.

E. B. Billings,
For five years.

Superintendent and Clerk—**Daniel Walden.**
Water Registrar—**Wallace O. Mudge.**
Pumping Engineer—**W. H. Messinger.**
Foreman of Piping—**Edwin Maxwell.**
Foreman of Services—**Henry Wheelock.**
Inspectors—**Winslow J. Rowell, W. B. Moulton, J. Frank Pool.**

PUBLIC WATER BOARD FOR 1889.

Alfred A. Mower, for one year.
David Knox, for two years.
Edwin Bates, for three years.
Edward B. Billings, for four years.
Quincy A. Towns, for five years.

ANNUAL REPORT.

Office of the Public Water Board,
January 1, 1889.

To the Honorable Mayor and City Council of the City of Lynn:

We herewith present our seventeenth annual report, together with the reports of the Superintendent of the works, the Water Registrar, and the Engineer in charge of the new construction. These reports give the result of the operations of the past year, and show the present condition of the department.

FINANCIAL.

The water loan Jan. 1, 1889, was	$1,422,500 00
Deduct from this the sinking funds, including the surplus of the past year	. 283,030 13
Leaves . . . . the net debt, which stands as the cost of the works.	$1,139,469 87

It will be seen by the Auditor's report that the receipts for water rates have been $134,750.64, an increase over the previous year of $10,972.54, and the surplus revenue, after paying interest and maintenance, to be carried to the sinking fund is $34,343.64. The cost of maintenance shows a large increase over that of 1887, which is accounted for by the large amount paid for damages to property occasioned by the burst in the main pipe on Market street, the expense of thawing out service pipes, frozen in the severe weather of last winter, the lowering of many services so that they would be better protected from the frost, and the cost of iron pipes purchased to replace cement-lined pipes. These unusual expenses have been charged to maintenance.

NEW RESERVOIR.

In accordance with the passage by the City Council of the order authorizing the Public Water Board to construct a dam at Penney brook for the purpose of storing its waters, the board engaged the services of Geo. H. Bishop, who has had a long experience as an hydraulic engineer, and an intimate acquaintance with our system of water supply. Under his supervision, work on the new basin was commenced about the first of September. The season has proved very unfavorable for the work of construction. The frequent rains have interfered with and delayed the work so that the progress has not been as rapid as was anticipated. A good commencement has been made, however; the necessary surveys having been completed, the land taken and condemned, and the dam is well under way. We hope before the close of another season to see the work well towards completion, and ready for the storage of water. With the building of this basin it may be said no further important work of construction will be required for some time to come, and an abundant supply of water of good quality will be assured.

The plan of utilizing the waters of Hawkes and Penney brooks by an open canal was a temporary expedient, which postponed the necessity for building new basins for a few years, but the time had arrived when further delay would imperil the city's water supply, and the City Council wisely accepted the recommendations of the Water Board, and authorized the construction of storage basins. This is a practical completion of the plan of water supply as first presented and outlined by the Water Board in its first annual report. Its final acceptance after years of controversy and experience is the best commentary on the correctness of their views.

STREET MAINS.

The large losses occasioned by breaks in the water mains, and the further liability of loss in this direction, determined the Board to replace some of the cement-lined pipes in our principal streets with cast-iron. A quantity has been purchased sufficient to replace those on Market and part of Broad streets, and, as soon as the ground is in condition in the spring, the work of relaying will be prosecuted. Some of our cement-lined pipes have been laid nearly twenty years, and on taking them up they have in most cases been found as bright and fresh as when first laid, with little appearance of wear. In fact, when they are not disturbed, we have no means of knowing how long these pipes will last.

In comparing cement-lined pipes with cast-iron, we are apt to compare them with an ideal pipe. It must be borne in mind that cast-iron pipes are not perfect. The record of other cities where the water is supplied through cast-iron pipes shows that leaks in the water mains are quite frequent, and that the damage occasioned by bursts aggregates a large sum every year.

When water was first introduced into our city, iron was three times its present price, and the cost of cement-lined pipes was not much more than half the cost of iron, which would seem to justify the city in laying the cement pipes at that time. Since the decline in the price of iron, the cost of the cement pipes approached so near that of the iron, that for the past four years all the pipes laid by the department have been of cast-iron. When cement pipes are well laid, in streets not liable to be frequently dug up, it is the opinion of the Board that there is no better pipe in use for water mains; but in the center of the city, with constant liability to be interfered with by the laying of sewers, gas and steam pipes, and where the streets are continually being opened to make connections, there is great danger of our pipes being injured by careless workmen; a pick in the hands of a heedless man knocks off some of the cement covering, or strikes a hole into the pipe, and the exposure soon causes it to rust; and the result is a break at this point.

Although the city's liability for losses of this nature has never been determined, yet the ground has been taken by the Board that, in occupying the streets for mains to supply the public with water, it is no more than equitable, that, in case of damage suffered by individuals through any defect in the pipes, the public should recompense them for their actual loss. While the Board believe this to be the fair and just course to pursue, and have always endeavored to meet and fairly adjust claims for damages arising from bursts in the water mains, they cannot say they are always met by those claiming losses in the same spirit. One of the most annoying things the Board has to deal with is to prevent excessive claims for damages being paid. If the cases are left to referees, the feeling that so often exists, that the city can bear the loss better than the individual, results in claims being allowed far in excess of the actual loss. For these reasons the board has decided to replace with cast-iron some of the pipes in the business section of the city, where the loss and damage from breaks is liable to be large.

REGULATING PLUMBING.

In previous reports the Board have recommended the passage of an ordinance requiring that all plumbers and pipe fitters shall be licensed before they are allowed to make any connections with the public water supply, and that they be required to report to the Board when they put in additional water fixtures. As the matter now stands the plumber is under no obligation to report when new fixtures are put in, and, unless the inspector discovers them, the city often loses the water rates. In accordance with the suggestions of the Board an ordinance was prepared requiring that all persons carrying on the business of plumbing shall have their name and place of business registered at the office of the Water Board before they can make connection with the city water; and that before doing any plumbing in a building, except in the case of repairs of leaks, they shall file at the office of the Water Board, upon blanks prepared for that purpose, a notice of the work to be performed. This ordinance was introduced in the City Council, and, if it could have passed, it would have accomplished all the board desired, but it failed because it was claimed that it conflicted with a recent act of the Legislature requiring all such authority to be vested in the Board of Health. The Board of Health, if they undertook the business, would be obliged to appoint inspectors, involving additional expense. This was not contemplated, the Water Board already having inspectors acquainted with the work, and it would seem to be in their line of duty. We would therefore recommend that the city petition the Legislature for an act authorizing the City Council to confer the authority to regulate plumbing upon the Water Board, rather than the Board of Health.

DUTIES OF THE WATER BOARD.

The requirements of the water department make constant demands upon the time and services of members of the Water Board. It is a department with large receipts and expenditures, involving questions of management and detail, many of which are necessarily referred to the Board for settlement. Questions more vexatious and annoying than if our works belonged to a private corporation arise, and have to be decided. Complaints of consumers must be given a careful hearing, and criticisms, often unfair and unjust, met and explained. A constant watchfulness, both of the consumption of water and the sources of supply, is required of those having this department in charge. The consequences of a short supply of water would be so serious that a grave responsibility rests upon those who have undertaken to furnish the public with water. Rules and regulations are provided, which experience has shown to be for the best interest of all concerned. The rules must be adhered to and equitably enforced. This causes many complaints from water-takers who feel aggrieved because they regard enforcement of rules made for the good of the whole a hardship in their particular case. Among our ten thousand water-takers complaints of this kind are so numerous, that, although the meetings of the Board are more frequent than those of any other department, it is often found that the evenings are hardly long enough to consider all the cases that come up for a hearing.

In view of these facts, is there any reason why the Water Board should not receive some pay for their services? It has been the custom of the City Council each year to vote a compensation to the Board of Health, and an ordinance has been recently passed fixing a salary for the members of the Board of Aldermen, thus establishing a policy of compensating its officials. To make an exception of a department where the duties are so arduous would seem to be an unfair discrimination in the treatment of the city's officials.

In advocating a compensation for the Water Board, the writer is relieved from the delicacy which a personal interest might involve, as he is soon to retire from the Board, but his experience convinces him that the Water Board should no longer be asked or expected to serve without pay, and would recommend the passage of an ordinance establishing a salary somewhat commensurate with the duties required.

WHERE AND WHEN STREET MAINS SHOULD BE LAID.

In previous reports we have recommended the passage of an order authorizing the Water Board to lay street mains wherever in their judgment it is deemed best. All applications for water pipes would then be made to the Water Board, who, having the facts in their possession, could give them prompt attention, instead of the unavoidable delays attending the present course. The City Council obtain their information in regard to these matters from the Water Board; why not leave the decision in their hands? It would be the most expeditious course, and there would seem to be no good reason why they should not have exclusive control of the question of where and when pipes should be laid.

Under the present system, contrary to the recommendations of the board, pipes have been ordered laid in streets where the income was entirely inadequate to warrant the outlay, and where there had never been any attempt to construct or grade them, the streets merely being laid out on paper. The Water Board have always advocated a liberal course in regard to laying pipes in new streets, but when pipes are ordered laid, where the income would not be two per cent. on the cost of the pipes, we consider it unfair and unjust to water-takers and taxpayers.

PERSONAL.

With the expiration of this year Daniel Walden retires from the service of this department, declining to be a candidate for re-election as superintendent. He has filled this office ever since the organization of the Water Board in 1871, with the exception of one year, and we desire to place on record our recognition of the faithful performance of his duties and of his entire devotion to the interests of the city, and of the ability with which he has managed the varied interests placed in his charge.

PUBLIC WATER BOARD,

By D. H. SWEETSER, *President.*

REPORT OF THE WATER REGISTRAR.

OFFICE OF THE WATER REGISTRAR,
LYNN, January 1, 1889.

D. H. Sweetser, Esq., President Public Water Board:

SIR, — I herewith present the financial condition of the department for the year ending Dec. 31, 1888.

RECEIPTS.

Water rates (fixture)		$94,762 49
" " meter		19,615 32
MISCELLANEOUS.		
Fire purposes	$11,800 00	
Street sprinkling	4,194 45	
Fire purposes (Saugus)	392 00	
Building purposes	369 16	
Repairs	361 30	
Damaged carpets	55 93	
Flushing sewers	50 64	
Land rent	37 50	
Filling cisterns	23 93	
Turning on services	19 50	
Water for road roller	18 40	
Sale of wood	11 50	
Sale of grass	10 00	
Use of seal locks	8 75	
Sale of old pipe	6 92	
Sale of fruit	4 00	
		17,363 98
Additional rates		2,809 70
Fines and summons		199 15
Total revenue		$134,750 64
Extra pipe, and labor		6,993 83
Sale of wood at new basin		674 50
Total receipts		$142,418 97

The whole amount of which has been paid into the city treasury, and the Treasurer's receipts taken therefor.

EXPENDITURES.

MAINTENANCE.

Damages	$9,956 55	
Pumping, wages, coal, oil, etc.	7,308 97	
Salaries and office expenses	5,154 81	
Repairs on services	4,551 66	
Repairs on mains, hydrants and gates	3,887 19	
Engines and boilers	2,317 69	
New supply	1,357 63	
Stable and workshop	1,033 17	
Meters	307 45	
Engine-house repairs	188 11	
Birch pond	26 22	
Breed's pond	23 69	
Reservoir	7 60	
		$36,120 74

CONSTRUCTION.

New supply	$47,489 10	
New basin	22,198 86	
Mains, hydrants and gates	16,012 58	
Breed's pond	14,773 45	
Services and court mains	11,842 78	
Meters	1,233 31	
Birch pond	326 24	
Tubular wells	324 30	
Pumping engine	200 00	
Total cost		114,400 62
Less amount received for pipe and labor	$6,993 83	
" " " for wood	674 50	
		7,668 33
Net cost		$106,732 29

COMPARATIVE STATEMENT OF REVENUE, 1888.

Amount collected during the year		$134,750 64
Amount outstanding fixture rates	$237 58	
Amount outstanding meter rates	63 70	
*Amount outstanding meter rates	5,061 09	
		5,362 37
		$140,113 01
Deduct amount due Jan. 1, 1888		5,632 74
Revenue for 1888		$134,480 27
Revenue for 1887		123,507 73
Increase for 1888		$10,972 54

---

* Last quarterly assessment.

STATEMENT OF NET EARNINGS FOR 1888.

Revenue		$134,480 27
Interest	$67,308 50	
Maintenance	36,120 74	
REBATE TO SAUGUS.		
37½ per cent. of receipts for 1887	361 91	
37½ per cent. of receipts for 1888	661 97	
		104,453 12
Net gain		$30,027 15

Following will be found the usual tables, exhibiting the number of buildings, families, stores, factories, etc., supplied with water, the class of premises to which meters are attached, the number and kinds of fixtures, the yearly revenues of the department, etc., etc.

Respectfully submitted,

WALLACE O. MUDGE,

Water Registrar.

SERVICES.

Whole number of services Jan. 1, 1888	7,805	
Put in during the year	520	
Total number Jan. 1, 1889		8,325
New services let on during the year		445
Services shut off during the year for non-payment		18
Services let on by payment of rates and fines		11
Services let on for change of ownership or occupancy		6
Services shut off by request, or for vacancy		147
Services let on, premises re-occupied		93
Services discontinued		11
Services put in at Saugus during the year		108
Making the whole number in Saugus, Jan. 1, 1889		198

The ratio of yearly increase in the number of services from 1876 is as follows:

1876	6.54 per cent.	1883	10.80 per cent.
1877	7.60 " "	1884	8.62 " "
1878	6.14 " "	1885	6.36 " "
1879	6.04 " "	1886	6.58 " "
1880	8.75 " "	1887	5.84 " "
1881	10.25 " "	1888	6.67 " "
1882	9.92 " "		

STATEMENT

SHOWING THE NUMBER OF BUILDINGS TO WHICH WATER IS SUPPLIED, ALSO THE NUMBER OF FAMILIES, VARIOUS FIXTURES, ETC., CONTAINED IN THE SAME, TOGETHER WITH THE NUMBER OF FIRE HYDRANTS, DECEMBER 31, 1888.

	LYNN.	SAUGUS.	TOTAL.
Dwellings	7,533	164	7,697
Stores	689	7	696
Factories	183	–	183
Offices	222	2	224
Restaurants and saloons	87	–	87
School-houses	34	1	35
Churches	25	–	25
Bakeries	27	–	27
Laundries	10	–	10
Engine-houses	5	–	5
Families	11,169	199	11,368
Boarding-houses	186	–	186
Faucets	18,753	347	19,100
Water closets	4,578	42	4,620
Bath tubs	1,550	34	1,584
Hand hose	2,470	68	2,538
Urinals	226	–	226
Heaters	221	4	225
Stationary engines	112	–	112
Motors	13	–	13
Greenhouses	25	1	26
Drinking fountains	24	–	24
Standpipes, fire	15	–	15
Standpipes for water carts	35	–	35
Sewer connections	15	–	15
Automatic sprinklers	11	–	11
Hydrants	602	80	682

STATEMENT

SHOWING THE CLASS OF PREMISES TO WHICH METERS ARE ATTACHED.

CLASS.	SIZES.									Total
	½	⅝	¾	1	1¼	1½	2	3	4	
Theatre	–	–	1	–	–	–	–	–	–	1
Board of Health	–	–	–	–	–	–	1	–	–	1
Bathroom	–	1	–	–	–	–	–	–	–	1
Brewery	–	–	–	–	–	1	–	–	–	1
Brickyard	–	–	–	2	–	–	–	–	–	2
Churches	–	1	–	–	1	–	–	–	–	2
City stable	–	–	–	1	–	–	–	–	–	1
Dwellings	1	12	8	1	–	–	–	–	–	22
Elevators	–	–	–	–	–	–	1	–	–	1
Engines	–	–	7	11	1	3	1	–	–	23
Factories	5	20	56	52	3	3	–	–	3	142
Fire engine-houses	–	–	1	1	–	–	–	–	–	2
Foundries	–	–	–	1	–	–	1	–	–	2
Gas works	–	–	–	–	–	2	1	–	–	3
Halls and buildings	–	–	1	3	–	–	–	–	–	4
Hotels	–	1	3	1	–	1	–	–	–	6
Laundries	–	2	4	2	–	–	–	–	–	8
Livery stables	–	5	2	2	–	–	–	–	–	9
Medical Laboratory	–	–	–	1	–	–	–	–	–	1
Oil works	–	–	–	1	–	–	–	–	–	1
Printing offices	–	1	–	1	–	–	–	–	–	2
Railroads	–	1	6	2	–	1	1	1	1	13
Saloons	–	–	1	2	–	–	–	–	–	3
Tugs and vessels	–	–	–	–	–	–	1	–	–	1
Motors 5	–	–	–	–	–	–	–	–	–	–
Stores and offices	2	6	6	–	–	1	–	–	–	15
Totals	8	50	96	84	5	12	7	1	4	267

STATEMENT

SHOWING THE YEARLY REVENUE OF THE DEPARTMENT SINCE THE FIRST INTRODUCTION OF WATER INTO THE CITY IN 1871.

From October 1, 1871, to January 1, 1872	$8,989 00
From January 1, 1872, to January 1, 1873	27,568 16
From January 1, 1873, to January 1, 1874	47,992 61
From January 1, 1874, to January 1, 1875	53,545 61
From January 1, 1875, to January 1, 1876	52,553 26
From January 1, 1876, to January 1, 1877	60,867 12
From January 1, 1877, to January 1, 1878	64,002 50
From January 1, 1878, to January 1, 1879	67,570 14
From January 1, 1879, to January 1, 1880	73,949 80
From January 1, 1880, to January 1, 1881	79,635 12
From January 1, 1881, to January 1, 1882	80,967 76
From January 1, 1882, to January 1, 1883	94,419 52
From January 1, 1883, to January 1, 1884	98,893 54
From January 1, 1884, to January 1, 1885	114,903 86
From January 1, 1885, to January 1, 1886	110,089 11
From January 1, 1886, to January 1, 1887	116,375 70
From January 1, 1887, to January 1, 1888	123,507 73
From January 1, 1888, to January 1, 1889	134,480 27
	$1,410,310 81

STATEMENT

SHOWING COST OF WORKS TO JANUARY 1, 1889.

Mains, hydrants and gates		$616,235 16
Services and court mains		198,504 44
New supply and land		187,515 28
Reservoir and land		131,581 49
Birch pond and land		87,033 84
Engine and boilers		72,198 00
Engine-house and land		56,674 05
Breed's pond and land		52,790 10
Pipe conduit and right of way		45,293 98
Force main and land		24,614 00
New basin		22,198 86
Highland service		21,565 52
Meters		10,590 13
Engineering		8,564 99
Tubular wells		8,370 35
Workshop and stable		1,957 12
		$1,545,687 31
Less amount received for extra pipe, labor, etc.,	$65,808 93	
Less amount received for wood	674 50	
		66,483 43
Total net cost to date		$1,479,203 88

REPORT OF THE SUPERINTENDENT.

LYNN, January 4, 1889.

D. H. Sweetser, Esq., President of the Public Water Board:

SIR, — In compliance with the city ordinance I respectfully submit herewith the annual report of the Superintendent, for the year 1888.

NEW SUPPLY.

During the months of January and February, the yield of the new supply was quite small; all that could be collected in the canal was allowed to flow direct to the pumping station, and was pumped to the reservoir for the daily supply of the city; owing to the severe cold weather only about one-half the quantity required for the daily consumption could be obtained from that source, and the other half was drawn from Breed's pond. During March and April the flow was largely increased, and the pump at the upper end of Birch pond was employed to pump the water into that pond, and was continued until the 28th of March, when, the ponds being nearly filled, pumping was discontinued. The quantity pumped was 91,582,794 gallons, the flow from the canal was sufficient to supply a portion of the daily consumption up to the 30th of June, a period much greater than ever before. The fall rains setting in much earlier than usual, and being so abundant, enabled us to obtain a full supply for the city by the 11th of October. In 1887 a full supply was not obtained from the canal before the 12th of December, two months later than this year. The supply was taken wholly from the canal until the 28th of November, when the heavy and almost continuous rains having filled Breed's pond to overflowing, the supply was taken from that pond during the remainder of the year. The amount received from the canal during this year, including the amount pumped into Birch pond, was 445,106,494 gallons. During the summer the tunnel was examined and cleaned, the canal was cleaned of all accumulations of leaves and rubbish, and the embankments and flumes repaired where necessary.

On the 12th of June an order was passed by the City Council, instructing the Water Board to construct a dam on either Hawkes brook or Penney brook. The board decided to make the construction on Penney brook, and in August the work of clearing was commenced under the direction of the City Engineer. On the first of September, Mr. Bishop, who had been engaged by the Water Board to superintend the work of construction, took charge of the work. As soon as the ground was sufficiently cleared the site of the dam was permanently located, and the work of preparing the foundation has been carried forward as fast as the nature of the work and the unfavorable weather would permit. Surveys have been rapidly pushed forward, the land necessary for the flowage of the pond has been surveyed and legally condemned by the City Council, and will be cleared of all wood and brush during the coming winter; next season the work will be vigorously pushed forward to a final completion; when finished the city will be beyond any fears of a water famine for several years to come.

PONDS.

No repairs of any magnitude has been required at either pond during the year, the outside of Breed's pond dam remains the same as at the date of last report. As the city has about completed the purchase of the land immediately surrounding the pond it is hoped that some necessary improvements may soon be made.

The continuous and extraordinary rains of the fall has filled the ponds to greater extent than ever before at this season of the year, Breed's pond being filled before the first of December, and Birch pond is now within a few inches of the overflow. On the 31st of December, 1887, Breed's pond contained 9 feet, 8 inches, and Birch pond contained 15 feet, 9 inches; on the 31st of December, 1888, Breed's pond contained 20 feet, 4½ inches, Birch pond contained 21 feet, ½ inch. The rainfall for the year has been 60.61 inches; the yield from the watershed of both ponds, exclusive of the water surfaces, has been 858,898,262 gallons, equal to 55 per cent. of the rainfall.

The consumption for the year has been 905,687,508 gallons, an average of 2,474,556 gallons per day, a total increase over last year of 37,341,170 gallons. The water used during the most of October and November, being taken direct from the canal, was somewhat discolored, a condition impossible to avoid under those circumstances; the building of the new basin on Penney brook will probably remedy that evil in the near future. The water from the ponds has been of excellent quality throughout the year. The general characteristics of the watershed of the new basin are identical with those of the present ponds, giving the assurance that when the basin is finished this city will have an abundant supply of pure and excellent water.

The State Board of Health, under the order of the legislature, has been making a monthly analysis of the different waters in the state used for supplying water for domestic purposes. The tables annexed contain their analysis of the waters of Breed's and Birch ponds during the past year.

RESERVOIR.

The reservoir has not required any repairs during the year, and is in good condition, except the outside slope of the embankment, which requires a good coating of loam to promote the growth of grass and improve its appearance.

TUBULAR WELLS.

When the new basin is finished there will probably be no further use for the tubular wells, and I would recommend the sale of the boiler and pump.

PUMPING STATION.

In the fall several leaks were developed in the roof, which have been repaired, and the buildings are now in good condition. The Leavitt engine had a careful overhaul in the spring, for the first time in four years. While overhauling the valves, a crack was discovered in the valve seating of the pump; this was strengthened and the valves replaced, but in order to be prepared for an emergency a new and much heavier seating has been prepared with new and improved valves, and is now on hand ready to be put in if the old one shows any signs of giving out. This engine still performs its work with the same economy as shown in previous years. The Deane engine has been run for 19 days in April and 11 days in May, while the Leavitt was being overhauled, otherwise it has not been run for the year. It is in good order and ready to start up on any emergency, but the necessity of procuring an engine of larger capacity and a higher rate of duty is increasing each year and should not be delayed much longer.

PIPES.

There has been several breaks in the cement pipes during the year, the one on Market street, October 1st, was the most disastrous in its consequences of any that has before occurred, causing great damage to property. This pipe was laid in 1869 to bring water from Flax pond for fire purposes, where it has been undisturbed. It is now in good condition, but the frequent excavations, made for the purpose of introducing sewers and steam-heating pipes, has injured the pipe in many places, and has been the chief cause of the breaks on that street. The board, soon after that break, decided to replace the pipe on Market street with a cast-iron pipe of larger capacity, which will meet the growth of the city for many years to come. The pipe has been purchased, and is now here. The work of relaying will be done in the spring.

During the year 7,281 feet of cast-iron pipe from 4 to 10 inches in diameter has been laid in 18 different streets, and 2,108 feet of smaller sized pipe has been laid in 15 different courts as mains. Fifteen gates have been set in connection with the new mains in streets, and 12 gates on court pipes. Twelve hydrants have been set on the pipe laid this year, and one on pipe previously laid. One hydrant has been discontinued. Four hundred and thirty-three services have been put in during the year, of an aggregate length of 22,110.8 feet. Twenty-two services have been discontinued. In trenching for mains and services, 1,200 feet of ledge has been excavated. One hundred and eight services have been put in in Saugus, at the expense of the owners, of an aggregate length of 5,950.5 feet. Two services have been put in in Swampscott, on the small pipe owned by private parties, and which is supplied from our works.

Seven new hydrants have been set in place of old ones that were broken. Sixteen hydrants have been repaired. One new 8″ gate has been put in to replace one broken by frost, 5 gates have been repaired, and 18 new gate-boxes have been set to replace that number rotted out. Five hundred and seventy-two feet of main pipe has been lowered on account of the lowering of the grade of the streets since the pipe was laid, and 19 services have been lowered in connection with the same.

The extreme cold weather of last winter, and the small quantity of snow on the ground, caused the earth to freeze to a much greater depth than usual. In consequence of this we had a large number of services frozen, and were obliged to keep a large force of men constantly employed in thawing them out, causing a large expenditure to this department, and much annoyance to those who had their services frozen. A large portion of the services frozen have since been lowered, and it is hoped a like misfortune will not soon occur again. Ninety services have been lowered, 316 corporations have been dug up and drilled out, 276 iron stop-boxes have been set in place of decayed wooden ones, 112 services have been repaired and 14 extended. Eight new meter-boxes have been put in to replace decayed ones, 28 new meters have been set, 43 have been taken out, cleaned, repaired and reset, 8 meters and two motors have been discontinued.

The mild weather of the last few days has enabled us to put in all the services that have been applied for up to the present time.

Annexed please find the usual tables, containing the record of the pumping engines, and the cost of pumping, per million gallons, with the Leavitt engine; the amount of water consumed for the year, with the daily consumption per capita; the amount of water collected from the watershed of Breed's and Birch ponds available for use each year, for the last fifteen years; the rainfall for the year; tables showing the amount of pipe laid, and the streets where laid, the gates and hydrants set, and details of work done; also a meteorological record for the year.

Having been connected with the works since they were first built in 1871, with the exception of one year, I desire to retire from the service of the department, and shall not therefore be a candidate for re-election for the coming year.

I would take this occasion to return my sincere thanks to the members of the board, past and present, for their long and continuous support, and the confidence which they have reposed in me. I also return hearty thanks to all the officers and employees of the department, who have so cheerfully worked by day and by night in the faithful performance of their respective duties.

Respectfully submitted,

DANIEL WALDEN.

1888. ANALYSIS OF WATER BY THE STATE BOARD OF HEALTH.

PARTS IN 100,000. BREED'S POND.

DATE OF EXAMINATION.	APPEARANCE.		ODOR.		RESIDUE ON EVAPORATION.				AMMONIA.		Chlorine.	Nitrogen as Nitrates.	Nitrogen as Nitrites.	Hardness.
	Turbidity.	Color.	Cold.	Hot.	Total.	Loss on Ignition.	Fixed.	Odor on Ignition.	Free.	Albuminoid.				
January 20	Distinct—very little sediment.	0.45	Faintly mouldy.	Mouldy.	4.45	1.90	2.55	Disagreeable.	.0024	.0205	.46	.009	none.	
February 18	Slight—very little whitish sediment.	0.6	Distinctly disagreeable.	Faintly grassy.	5.05	1.90	3.15	Peaty.	.0129	.0225	.69	.008	none.	
March 16	Distinct—very little sediment.	0.5	None.	Faint vegetable—cucumber.	4.35	1.55	2.80	Peaty, slightly disagreeable.	.0074	.0252	.50	.008	none.	
April 20	Distinct—very little whitish sediment.	0.4	Faintly mouldy.	Very faintly straw-like.	2.95	1.10	1.85	Peaty and somewhat disagreeable.	.0001	.0207	.41	.002	none.	
May 18	Slight—a little flocky sediment.	0.35	Faintly straw-like.	Distinctly grassy	3.45	1.35	2.10	Peaty.	.0016	.0174	.41	.000	slight.	0.6
June 26	Distinct, minute organisms.	0.6	Distinctly straw-like.	Very faintly straw-like.	3.00	1.10	1.90	Faintly peaty and disagreeable.	.0006	.0180	.43	.0050	none.	
July 20	Distinct—a little whitish sediment.	0.7	Somewhat disagreeable.	Faintly musty.	3.35	1.30	2.05	Faintly peaty.	.0000	.0238	.41	.0000	.0001	
August 17	Distinct—some greenish-white sediment.	0.5	Disagreeable.	Very disagreeable.	3.25	1.05	2.20	Very faintly peaty.	.0012	.0246	.42	.0000	less than .0001	
September 19	Slight—a little flocky sediment.	0.3	Distinctly disagreeable.	Distinctly disagreeable.	3.35	1.25	2.10	Faintly peaty.	.0008	.0280	.40	.0030	.0002	
October 19	Slight—a little greenish flocky sediment.	0.6	Distinct, peculiar, like geranium.	Faintly grassy, disagreeable.	3.50	1.40	2.10	Strongly peaty.	.0010	.0252	.40	.0070	.0004	
November 16	Slight—very little sediment.	0.7	None.	Very faint, or none.	3.90	1.45	2.45	Faint peculiar peaty.	.0048	.0264	.41	.0120	.0003	
December 12	Slight—slight sediment, earthy and flocky.	0.0	Faintly straw-like.	Very faint, or none.	3.90	1.70	2.20	Slightly disagreeable.	.0020	.0200	.43	.0090	.0001	
Averages.		0.47			3.71	1.42	2.29		.0029	.0227	.45	.0052	.0001	

1888. ANALYSIS OF WATER BY THE STATE BOARD OF HEALTH.

PARTS IN 100,000. BIRCH POND.

DATE OF EXAMINATION.	APPEARANCE.		ODOR.		RESIDUE ON EVAPORATION.				AMMONIA.		Chlorine.	Nitrogen as Nitrates.	Nitrogen as Nitrites.	Hardness.
	Turbidity.	Color.	Cold.	Hot.	Total.	Loss on Ignition.	Fixed.	Odor on Ignition.	Free.	Albuminoid.				
January 20	Very slight—very little sediment.	0.4	Very faint or none.	Distinctly musty.	4.30	2.10	2.20	Offensive.	.0085	.0314	.49	.023	none.	
February 18	Distinct—some light, flocky sediment.	0.45	Faintly mouldy.	Faintly wooden.	4.20	1.90	2.30	Peaty.	.0131	.0315	.65	.015	none.	
March 16	Distinct—a little sediment.	0.15	Peculiar, very faintly disagr'ble.	Very faint, vegetable.	2.70	1.15	1.55	Peaty, slightly disagreeable.	.0017	.0300	.36	.005	none.	
April 20	Decided—very little sediment.	0.45	Faintly mouldy.	Faint, peculiar.	3.25	1.10	2.15	Peaty and somewhat disagreeable.	.0018	.0250	.43	.003	slight.	
May 18	Distinct—some earthy and flocky sediment.	0.2	Faintly straw-like	Distinctly grassy	4.40	1.50	2.90	Peaty and somewhat disagreeable.	.0000	.0242	.46	.005	none.	0.8
June 26	Distinct—some greenish sediment.	0.45	Distinctly straw-like.	Faintly straw-like.	3.20	1.25	1.95	Faintly peaty.	.0022	.0248	.44	.003	less than .0001	
July 20	Slight—some greenish-white sediment.	0.35	Distinctly musty.	Faintly musty.	3.40	1.35	2.05	Faintly peaty.	.0008	.0262	.41	.000	.0001	
August 17	Decided—a little greenish sediment.	0.25	Very faint or none.	None.	3.25	1.10	2.15	Very faintly peaty, slightly disagre'ble.	.0000	.0282	.45	.002	.0001	
September 19	Distinct — considerable greenish sediment.	0.3	Distinctly straw-like.	Distinct, rather disag'le, pecul'r.	3.40	1.20	2.20	Peaty.	.0016	.0304	.43	.003	.0002	
October 19	Distinct—a little greenish, flocky sediment.	0.3	Distinct, peculiar, like geranium.	Very faintly grassy.	3.05	1.30	1.75	Peaty and peculiar.	.0004	.0304	.41	.009	.0004	
November 16	Slight—very little sediment.	0.3	None.	Distinct, peculiar, sweetish.	3.30	1.25	2.05	Slightly disagreeable.	.0014	.0310	.42	.0150	.0002	
December 12	Slight—slight sediment, earthy and flocky.	0.35	Faintly straw-like.	Very faint or none.	3.35	1.55	1.80	Slightly disagreeable.	.0002	.0222	.45	.0150	.0001	
Averages		0.33			3.48	1.40	2.09		.0026	.0287	.45	.0082	.0001	

SUMMARY OF STATISTICS.

REPORT OF 1888.

IN ACCORDANCE WITH SUGGESTIONS ADOPTED BY THE NEW ENGLAND WATER WORKS ASSOCIATION.

LYNN WATER WORKS, LYNN, MASS.

Population by census of 1885	45,861
Date of construction	1870 to 1872

Owned by the City of Lynn.

Source of supply: — Two artificial storage basins, formed by damming two brooks, and the water of two other brooks in North Saugus taken direct.

Mode of supply: — By gravitation to the pump well, and pumped thence to distributing reservoir at an elevation of 177 feet above mean high tide, by one Leavitt engine, built by I. P. Morris & Co., of Philadelphia, of 5,000,000 gallons daily capacity, and one Deane engine, built by the Deane Steam Pump Co., of Holyoke, Mass., of 3,000,000 gallons daily capacity.

Kind of coal used, George's Creek, Cumberland.

Cost of coal, $4.90 and $4.95 per net ton delivered.

Coal consumed for the year in pounds, including heating	1,398,105
Total pumping in gallons	906,397,617
Average head, including friction in feet	168.63
Number of gallons pumped per pound of coal	641.1
Duty on total coal consumed, no deductions	101,831,525
Cost of pumping (figured on pumping station expenses, viz: $8,269.97) per million gallons into the reservoir	$9.12.25
Per million gallons one foot high	$0.05.41

FINANCIAL.

RECEIPTS —	For water for all purposes	$133,012 21
	Summons, shutting off and letting on	227 40
	Rent and sundries	487 15
	Total revenue	$133,726 76
	Labor and material	6,993 83
	Total receipts	$140,720 59
EXPENDITURES —	Management and repairs	$26,164 19
	Interest on bonds	67,308 50
	Damages	9,956 55
	Total	$103,429 24
	Carried to credit of construction	6,993 83
	Carried to sinking fund	30,297 52
		$140,720 59

CONSUMPTION.

Estimated population to date, Lynn and Saugus	53,529
Estimated population supplied	50,256
Total number of gallons consumed for the year	905,687,508
Total number of gallons metered	100,308,150
Average daily consumption in gallons	2,474,556
Gallons per day to each consumer	49.2

DISTRIBUTION.

Kind of pipe used, wrought-iron cement-lined, and cast-iron.

Size, from 4 to 16 inches diameter.

Extended	1 m. 4,109 ft.
Total now in use	82 m. 4,891 ft.
Number of leaks for the year	82
Hydrants added	12
Hydrants now in use	602
Gates added	27
Gates now in use	713
Range of pressure at center of city for day and night	54 to 65 lbs.

SERVICES.

Kind of pipe used, iron cement-lined.

Size of pipe used, ¾″ to 2″ diameter.

Extended	22,110 ft.
Total now in use	62 m. 1,856 ft.
Number of services added	433
Number of services now in use	8,233
Meters added	18
Meters now in use	254

TABLE I.

RECORD OF THE LEAVITT ENGINE FOR THE YEAR ENDING DECEMBER 31, 1888.

DATE.	No. of pumping days.	Total pumping time per month.	Average pumping time per day.	Number of revolutions per month.	Average revolutions per minute.	COAL CONSUMED.				Ashes and cinders.	Ashes and cinders.	Gallons pumped per month, allowing 4 per cent. for loss of action in the pump.	Average number of gallons pumped per pound of coal.	Average number of gallons raised 100 feet high per pound of coal.	Average head against the pump.	Average duty in lbs. of water raised one foot high per 100 lbs. of coal, no deduction for ashes and cinders.	Average duty in lbs. of water raised one foot high per 100 lbs. of coal, the ashes and cinders deducted.	Oil.	Waste.
						Raising steam.	Pumping.	Banking.	Total.										
Month.	Days	H. M.	H. M.	Rev.	Rev.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Per ct.	Gallons.	Galls.	Galls.	Feet.	Pounds.	Pounds.	Gal.	Lbs.
January . .	31	401.00	12.56	434,450	18.05	9,300	103,350	6,200	118,850	9,770	8.22	88,046,643	681.9	1148.86	168.48	99,760,504	108,695,782	8.5	10
February .	29	387.00	13.21	418,350	18.01	8,700	98,900	5,800	113,400	10,050	8.86	78,043,192	688.2	1159.47	168.48	100,680,355	110,461,077	8.0	10
March . . .	31	381.00	12.17	412,900	18.06	9,700	97,650	6,000	113,350	11,790	10.40	77,026,495	679.5	1144.82	168.48	99,412,587	110,953,207	8.0	10
April . . .	8	88.20	11.02	96,500	18.21	2,400	22,750	1,600	26,750	2,087	7.80	18,002,057	673.7	1135.05	168.48	98,451,321	106,782,339	2.5	16
May	14	222.00	15.51	213,911	16.06	2,500	52,600	1,500	56,600	4,418	7.81	39,905,097	705.3	1188.28	168.48	103,141,800	111,874,322	8.0	15
June	26	402.20	15.48	408,552	16.92	5,100	96,750	3,400	105,250	8,750	8.31	76,215,375	724.1	1219.99	168.48	105,935,923	115,541,512	8.0	12
July	25	431.35	17.16	469,044	18.11	4,500	114,650	3,000	122,150	7,840	6.82	87,500,158	716.3	1206.82	168.48	104,794,414	111,981,783	8.0	12
August . .	27	429.00	15.53	474,169	18.42	5,400	114,900	3,400	123,700	10,400	8.38	88,456,226	715.0	1205.99	168.67	104,726,736	114,339,781	8.0	12
September	25	351.40	14.04	390,798	18.52	5,700	93,950	4,000	103,650	10,380	9.98	72,903,367	703.3	1187.66	168.87	102,951,317	114,185,979	12.0	12
October . .	27	362.45	13.26	398,100	18.29	6,900	93,655	4,600	105,155	8,150	7.73	74,265,555	706.2	1192.63	168.88	103,363,239	112,029,567	8.0	10
November	25	336.25	13.27	365,600	18.11	8,200	88,600	4,000	100,800	11,330	11.14	68,202,680	680.5	1148.23	168.88	99,218,478	111,784,091	8.0	12
December .	25	342.15	13.41	369,200	17.98	7,600	89,150	3,800	100,550	11,000	10.82	68,874,260	684.9	1156.66	168.88	100,338,678	112,514,359	8.0	10
Totals and averages.	293	4,135.20	14.07	4,451,574	17.94	76,000	1,066,905	47,300	1,190,205	105,965	8.90	830,441,105	697.7	1176.53	168.63	101,831,525	111,748,515	95	141

TABLE I.—CONTINUED.

COST OF PUMPING WITH THE LEAVITT ENGINE FOR THE YEAR 1888.

781,400 pounds of coal, at $4.90 per net ton		$1,914 43
412,655 pounds of coal, at $4.95 per net ton		1,021 32
Repairs on engine and boilers		900 88
Oil, packing, waste, etc.		215 23
Sundry small stores		40 11
Insurance		41 66
Wages of Engineers and Firemen		3,283 76
		$7,417 39
Cost of raising one million gallons into the reservoir	$8 93 19	
Cost of raising one million gallons one foot high	0 05 29	

TABLE II.

RECORD OF THE DEANE ENGINE FOR THE YEAR ENDING DECEMBER 31, 1888.

DATE.	No. of pumping days.	Total pumping time per month.	Average pumping time per day.	Number of revolutions per month.	Average revolutions per minute.	COAL CONSUMED.				Ashes and cinders.	Ashes and cinders.	Gallons pumped per month, allowing 4 per cent. for loss of action in the pump.	Average number of gallons pumped per pound of coal.	Average number of gallons raised 100 feet high per pound of coal.	Average head against the pump.	Average duty in lbs. of water raised one foot high per 100 lbs. of coal, no deduction for ashes and cinders.	Average duty in lbs. of water raised one foot high per 100 pounds of coal, the ashes and cinders deducted.	Oil.	Waste.
						Raising steam.	Pumping.	Banking.	Total.										
Month.	Days	H. M.	H.M.	Rev.	Rev.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Per ct.	Gallons.	Galls.	Galls.	Feet.	Pounds.	Pounds.	Gal.	Lbs.
January . .	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
February .	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
March . . .	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
April . . .	19	373.35	19.39	492,101	21.95	4,200	120,750	2,750	127,700	9,963	7.72	46,257,494	362.2	560.03	154.62	48,740,426	52,779,945	7	4
May	11	237.35	21.36	315,947	22.16	1,250	73,400	1,200	75,850	5,922	7.81	29,699,018	388.9	594.08	152.76	51,965,916	56,366,759	3	10
June	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
July	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
August . .	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
September	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
October . .	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
November	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
December .	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Totals and averages.	30	611.10	20.22	808,048	22.04	5,450	194,150	3,950	203,550	15,885	7.80	75,956,512	372.6	572.65	153.69	50,353,171	54,573,352	10	14

TABLE III.

SHOWING THE CONSUMPTION OF WATER FOR THE YEAR ENDING DECEMBER 31, 1888.

	Monthly consumption.	Average consumption per day.	Average daily increase.	Average daily decrease.	Average to each consumer.	Average to each inhabitant.
Month.	Gallons.	Gallons.	Gallons.	Gallons.	Galls.	Galls.
January . .	80,788.817	2,606,091	345,611		51.8	48.5
February .	77,785,366	2,682,254	76.163		53.3	50.1
March . .	76,571,336	2.470,043		212,211	49.1	46.1
April . .	66.830,215	2,227.674		242,369	44.3	41.6
May . . .	67,681,886	2.183,286		44,388	43.4	40.8
June . . .	75,566,946	2,518.898	335,612		50.1	47.0
July . . .	87,761,848	2,831,027	312.129		56.3	52.9
August . .	87,998,269	2,838,654	7,627		56.5	53.0
September .	75,161,290	2,505,376		333,278	49.8	46.8
October . .	72,593,508	2.341,726		163,650	46.6	43.7
November .	67,681.232	2,256,041		85,685	44.9	42.1
December .	69,266.795	2,234,413		21,628	44.4	41.7
Totals and Averages.	905,687.508	2,474,556			49.2	46.2

TABLE IV.

SHOWING THE AMOUNT OF RAINFALL ON THE WATERSHED OF BREED'S AND BIRCH PONDS, EXCLUSIVE OF THE WATER SURFACES, AMOUNT OF WATER DRAWN FROM THE PONDS, AMOUNT WASTED, AMOUNT RECEIVED INTO THE PONDS, AND PERCENTAGE OF THE RAINFALL AVAILABLE FOR USE FROM 1874 TO 1888.

Year.	Rainfall.	Amount of rainfall on the watershed of Breed's and Birch ponds.	Amount of water drawn from the ponds for consumption.	Amount of water wasted from the ponds.	STORAGE.		Total amount of the rainfall received into the ponds.	Daily average.	Percentage of the rainfall received into the ponds.	Amount drawn from the tubular wells and from the new supply.
					Increase.	Decrease.				
	Inches.	Gallons.	Gallons.	Gallons.	Gallons.	Gallons.	Gallons.	Gallons.	Per cent.	Gallons.
1874 . .	34.92	837,154,949	485,189,801	21,200,000	-	47,545,394	458,844,407	1,257,108	54.81	
1875 . .	41.85	1,003,305,644	471,387,757	11,609,267	60,281,293	-	543,278,317	1,488,433	54.24	
1876 . .	45.05	1,080,099,392	395,084,629	20,500,000	74,452,111	-	490,036,740	1,342,566	45.37	
1877 . .	45.65	1,094,184,734	402,161,193	131,277,511	60,846,704	-	594,285,408	1,628,179	54.29	
1878 . .	57.36	1,379,911,034	417,678,296	205,081,247	64,712,199	-	687,471,742	1,883,484	49.82	
1879 . .	41.04	983,957,360	456,319,019	164,095,022	-	203,370,014	417,044,027	1,142,586	42.38	
1880 . .	37.28	893,809,219	401,905,570	-	-	49,803,426	352,102,144	969,663	39.38	50,069,938 T. W.
1881 . .	46.31	1,110,771,709	439,992,684	42,355,919	138,262,844	-	620,611,447	1,700,305	55.87	27,093,350 T. W.
1882 . .	36.39	872,470,956	551,428,907	16,792,968	-	92,189,985	476,031,890	1,304,197	54.55	
1883 . .	30.14	722,624,655	424,426,586	61,461,602	-	113,600,091	372,288,097	1,019,967	51.51	144,233,861 T. W.
1884 . .	47.75	1,144,833,429	541,225,365	104,208,215	53,996,958	-	699,430,538	1,911,012	61.09	74,426,562 T. W. 20,852,455 N. S.
1885 . .	45.01	1,079,140,370	291,234,263	43,286,356	196,294,799	-	530,815,418	1,454,289	49.19	409,430,001 N. S.
1886 . .	48.26	1,154,423,833	529,088,399	62,524,868	-	129,350,700	462,262,567	1,266,473	40.04	6,847,858 T. W. 237,674,057 N. S.
1887 . .	48.86	1,171,446,311	613,106,965	30,142,382	6,363,250	-	650,612,597	1,782,500	55.54	327,239,373 N. S.
1888 . .	60.61	1,561,775,908	460,581,014	82,565,913	315,751,335	-	858,898,262	2,346,716	55.00	445,106,494 N. S.

TABLE V.

SHOWING THE DEPTH OF WATER IN THE PONDS FOR EACH WEEK DURING 1888.

Date.		Breed's Pond.		Birch Pond.		Date.		Breed's Pond.		Birch Pond.		Date.		Breed's Pond.		Birch Pond.	
		Feet.	In.	Feet.	In.			Feet.	In.	Feet.	In.			Feet.	In.	Feet.	In.
Jan.	2	10	2½	16	0½	May	5	21	1	21	11	Sept.	1	14	5	16	5½
"	7	10	9	16	2½	"	12	21	3	22	3	"	8	13	10	15	10
"	14	10	10	16	4	"	19	21	0	22	1½	"	15	13	6½	15	5½
"	21	10	6½	16	5½	"	26	21	0½	21	8	"	22	13	6	15	4
"	28	9	10	16	6½	June	2	21	0	21	8½	"	29	14	4	15	5½
Feb.	4	8	6½	16	6½	"	9	20	7	21	6½	Oct.	6	14	6	15	3
"	11	8	3½	16	8½	"	16	20	1½	21	6	"	13	15	1½	15	4½
"	18	7	4	16	8½	"	23	19	4	21	4	"	20	15	7	15	6½
"	25	10	2	16	11½	"	30	18	5½	21	1½	"	27	16	2½	15	9
March	3	11	11	18	0	July	7	17	9	20	8	Nov.	3	16	9½	15	11
"	10	12	4	17	10	"	14	17	1	20	1	"	10	17	1½	16	2
"	17	13	3½	18	5½	"	21	17	0½	19	1½	"	17	17	9	16	6
"	24	15	8	20	0	"	28	16	7	18	8	"	24	18	5	16	8
"	31	17	6½	21	4½	Aug.	4	16	0	18	2	Dec.	1	21	1½	18	9
April	7	19	2	21	8½	"	11	15	7	17	8½	"	8	20	8½	19	2½
"	14	20	2	21	11	"	18	15	3	17	4	"	15	20	4½	19	9
"	21	20	9	22	0½	"	25	15	0	17	0½	"	22	20	7	20	10
"	28	21	0½	21	11½							"	29	20	4	21	0

RAINFALL

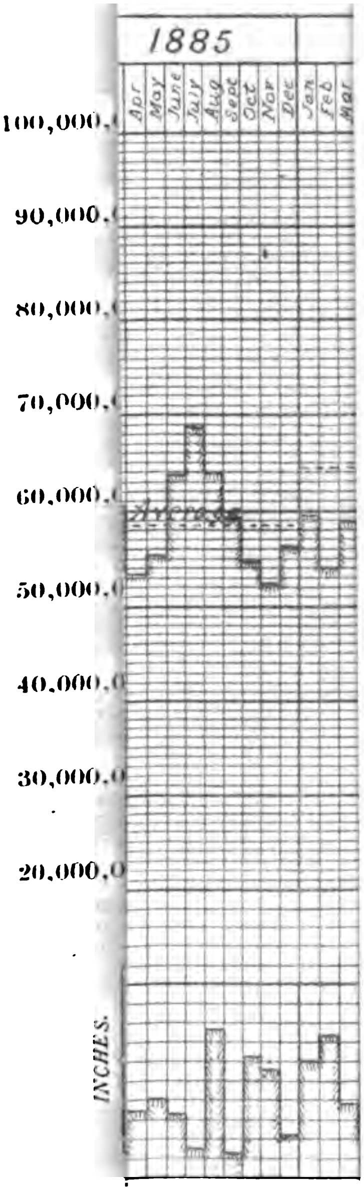
1885
Apr
May
June
July
Aug
Sept
Oct
Nov
Dec
Jan
Feb
Mar
100,000.0
90,000.0
80,000.0
70,000.0
60,000.0
Average
50,000.0
40,000.0
30,000.0
20,000.0
INCHES.

TABLE VI.

SHOWING THE RAINFALL AT THE PUMPING STATION FOR 1888.

Day of the month.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1 .	1.28	.....	.....	0.53	0.03	.....	.....	.....	0.06	0.47	.....	.....
2 .	.....	.....	0.08	0.39	.....	.....	.....	.....	.....	0.50	.....	.....
3 .	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.05	.....
4 .	0.09	0.45	.....	.....	0 17	.....	.....	.....	0.01	.....	.....	0.03
5 .	.....	.....	.....	0.83	0.05	... .	.....	0.10	.....	0.05	.....	0.02
6 .	.....	.....	.....	.....	.....	0.11	.....	1.25	.....	0.88	.....	.....
7 .	.....	0.06	.....	.....	.....	.....	.....	.....	... .	0.60	.....	.....
8 .	0.08	0.04	.....	.....	0.50	.....	.....	0.01	1.12	.....	0.26	0.20
9 .	0.05	.....	.....	.....	.....	.....	.....	.....	0.23	.....	0.52	0.35
10 .	0.11	0.30	.....	0.42	0.21	.....	.....	.....	.....	.....	0.65	.....
11 .	.....	0.52	.....	0.10	1.70	0.24	0.50	.....	0.41	.....	.....	1.13
12 .	.....	.....	2.55	0.01	1.00	.....	.....	0.15	0.18	0.30	.....	.....
13 .	0.42	.....	0.35	.....	0.77	.....	.....	1.56	.....	0.11	.....	.....
14 .	.....	.....	0.05	0.18	0.08	0.87	.....	.....	.....	.....	.....	.....
15 .	0.09	.....	.....	.....	0.13	0.19	.....	0.02	.....	.....	0.83	.....
16 .	.....	....	0.01	.....	.....	.....	.....	.....	0.09	0.03	0.22	0.05
17 .	1.00	.....	.....	.....	.....	.....	.....	0.39	1.70	0.11	.....	3 30
18 .	0.02	.....	.....	0.02	0.28	.....	.....	.....	0.25	.....	.....	0.05
19 .	.....	.....	.....	.....	0.02	.....	0.17	.....	0.02	0.52	0.37	.....
20 .	.....	0.90	0.01	0.15	.....	0.07	0.14	.....	0.23	.....	.....	.....
21 .	.....	.....	1.12	0.09	.....	0.01	.....	3.23	1.00	.....	.....	.....
22 .	.....	.....	.....	.....	.....	.....	1.04	.....	0.02	.....	0.03	.....
23 .	0.03	.....	.....	.....	.....	0.01	0.21	.....	.....	0.32	.....	.....
24 .	.....	.....	.....	.....	0.03	0.01	0.04	.....	.....	0.80	0.10	.....
25 .	0.70	0.75	.....	.....	.....	.....	.....	.....	1.56	.....	3.05	.....
26 .	.....	.....	1.00	.....	0.03	0.45	.....	.....	1.95	0.05	1.00	0.13
27 .	.....	.....	0.40	.....	.....	.....	0.06	.....	.....	0.54	0.80	0.20
28 .	.....	.....	0.19	.....	0.63	0.03	.....	.....	.....	0.12	.....	.....
29 .	.....	.....	0.12	.....	0.17	.....	.....	.....	.....	.....	0.25	.....
30 .	.....	.....	.....	.....	0.04	0.10	.....	.....	.....	.....	.....	.....
31 .	.....	.....	.....	.....	0.03	.....	0.38	0.09	.....	.....	.....	.....
	3.87	3.02	5.88	2.72	5.87	2.09	2.54	6.80	8.83	5.40	8.13	5.46

Rainfall for the year, 60.61.

TABLE VII.

SHOWING THE AMOUNT AND SIZE OF PIPE LAID IN 1888.

STREETS WHERE LAID.			Kind of pipe.	SIZE OF PIPE.			
Street.	From.	To.		10″	8″	6″	4″
Alley . .	Extension .	–	C. I.	–	–	388.0	–
Broadway pl.	Broadway .	–	"	–	–	230.0	–
Beyer ct. .	Lewis . .	–	"	–	–	–	368.6
Circuit av.	High Rock .	–	"	–	–	363.0	–
Clovelly .	Western av.	–	"	–	–	252.5	–
Eastern av.	Oakwood av.	–	"	508.5	–	–	–
Eastlake av.	Extension .	–	"	–	–	181.2	–
Grant St. .	Bay View av.	–	"	–	310.0	–	–
Harvest .	Eastern . .	–	"	–	–	428.0	–
Ingalls av. .	Chatham .	–	"	–	–	513.0	–
Jenness . .	Roanoke .	End of street	"	–	–	1,665.0	–
Linwood .	Walnut . .	Pine Gr've av	"	–	–	1,036.5	–
Laurel . .	Extension .	–	"	–	–	206.0	–
Tudor . .	Beach . .	–	"	–	–	–	161.0
Whittier .	Hanover .	Lloyds ct. .	"	–	–	–	619.0
Woodlawn .	Extension .	–	"	–	–	51.0	–
Totals . . . . :				508.6	310.0	5,314.0	1,148.6

TABLE VII.—CONTINUED.

SHOWING THE AMOUNT AND SIZE OF PIPE LAID IN COURTS IN 1888.

COURTS WHERE LAID.			SIZE OF PIPE.		
Court.	From.	To.	2"	1½"	1¼"
Beacon Hill av. . .	High Rock av. .	–	–	–	135.3
Cypress av. . . .	Extension . . .	–	–	17.5	–
Hoag's ct.	Stickney st. . .	End of ct.	–	–	192.2
Heffernan ct. . . .	Franklin st. . .	End of ct.	–	148.0	58 9
Lakeside ct. . . .	Extension . . .	–	38.7	–	–
Myrtle st. . . .	Walnut st. . . .	–	–	–	133.9
Mountain ct. . . .	Highland av. . .	–	316.6	–	–
Oakwood place . .	New Chatham st.	End of ct.	–	185.0	–
Pearl-street place .	Pearl st. . . .	End of ct.	–	126.6	–
*River st.	Extension . . .	–	–	–	41.0
Ridgeway st. . . .	End of pipe . .	Adams st.	126.5	–	–
Sheridan st . . .	Jefferson st. . .	–	151.5	–	–
South Common st. .	Elm st.	–	–	–	98.0
Valley av.	High Rock av. .	–	–	123.5	–
*Richmond pl. . .	Pleasant st. . .	End of ct.	159.6	56.4	–
Totals			792.5	657.0	659.0

	Miles.	Feet.
Total extension in 1888	1	4,109.5
Previously laid	81	782.0
Total pipe laid to January 1st, 1889	82	4,891.5
Total laid in Saugus	8	4,490.0
Private pipe in Swampscott	–	1,778.0
Total pipe supplied by the works	92	599.0

TABLE VIII.

SHOWING THE LOCATION OF GATES SET IN 1888.

STREET.	LOCATION.	Size. Inches.
Broadway place.	9 ft. S. from the N. line of Broadway place; ½ ft. W. from the W. line of Broadway	6
Beyer ct.	6¾ ft. E. from the W. line of Beyer ct.; 1 ft. N. from the N. line of Lewis st.	4
Circuit ave.	33½ ft. W. from the E. line of Circuit av.; 2 ft. S. from the S. line of High Rock st.	6
Clovelly	17½ ft. W. from the E. line of Clovelly st.; 1 ft. S. from the S. line of Western ave.	6
Eastern ave.	19½ ft. W. from the E. line of Eastern av.; on the line of the N. line of Oakwood av.	10
Grant	15½ feet S. from the N. line of Grant st.; on the line of the E. line of Bay View av.	8
Harvest	15½ ft. S. from the N. line of Harvest st.; on the line of the E. line of Eastern av.	6
Ingalls ave.	15 ft. S. from the N. line of Ingalls av.; ½ ft. E. from the E. line of Chatham st.	6
Jenness	13 ft. S. from the N. line of Jenness st.; 6½ ft. E. from the hydrant on the 1st angle of st	6
Jenness	Blow-off 17½ ft. S. from the N. line of Jenness st.; 31½ ft. E. from the 2d angle of the st.	4
Linwood	18½ ft. W. from the E. line of Linwood st.; on the line of the N. line of Walnut st.	6
Linwood	18½ ft. W. from the E. line of Linwood st.; on the line of the N. line of Walnut st.	6
Roanoke	16½ ft. S. from the N. line of Roanoke st.; 1 ft. W. from the W. line of Jenness st.	6
Tudor	18 ft. N. from the S. line of Tudor st.; 3 ft. E. from the E. line of Beach st.	4
Whittier	8 ft. E. from the W. line of Whittier st.; on the line of the S. line of Hanover st.	4

TABLE VIII.—CONTINUED.

THE LOCATION OF GATES SET IN COURTS IN 1888.

STREET.	LOCATION.	Size. Inches.
Beacon Hill av.	18 ft. S. from the N. line of Beacon Hill av.; on the line of the E. line of High Rock av.	1¼
Heffernan ct.	13 ft. S. from the N. line of Heffernan ct.; on the line of the W. line of Franklin st.	1½
Hoag ct.	3 ft. W. from the E. line of Hoag ct.; on the line of the N. line of Stickney st.	1¼
Mountain ct.	13½ ft. S. from the N. line of Mountain ct.; on the line of the W. line of Highland av.	2
Myrtle	49½ ft. from the W. line of Myrtle st.; 31 ft. from the S.-E. corner of Walnut st.	1¼
Oakwood place	3½ ft. S. from the N. line of Oakwood place; on the line of the E. line of New Chatham st.	1½
Pearl-st. place	4½ ft. S. from the N. line of Pearl-st. place; on the line of the E. line of Pearl st.	1½
Ridgeway	11½ ft. W. from the E. line of Ridgeway st.; on the line of the S. line of Adams st.	2
Richmond place	6¼ ft. N. from the S. line of Richmond place; 6½ ft. E. from the W. line of Pleasant st.	2
Sheridan	13¼ ft. E. from the W. line of Sheridan st.; on the line of the S. line of Jefferson st.	2
So. Common	34½ ft. S. from N. line of So. Common st.; on the line of the E. line of Elm st.	1¼
Valley av.	8½ ft. E. from the W. line of Valley av.; on the line of the N. line of High Rock st.	1½

Additional gates set in 1888	27
Number previously set	686
Total number of gates set to Jan. 1, 1889	713

TABLE IX.

SHOWING THE LOCATION OF HYDRANTS SET IN 1888.

STREET.	LOCATION.
Broadway	50 feet north from Daniel street.
Beyer court	300 feet north from Lewis street.
Eastern avenue	210 feet north from Oakwood avenue.
Eastlake avenue	410 feet east from Chatham street.
Harvest street	400 feet east from Eastern avenue.
Ingalls street	376 feet east from Chatham street.
Jenness street	at the first angle of the street.
Jenness street	100 feet east from Mr. Parker's house.
Jenness street	At the end of the pipe.
Linwood street	386 feet north from Walnut street.
Linwood street	810 feet north from Walnut street.
Pinnacle avenue	330 feet south from High Rock street.
Whittier street	400 feet south from Hanover street.

Number of hydrants set in 1888	13
Number previously set	590
Total number set	603
One hydrant discontinued	1
Total in use January 1st, 1889	602

TABLE X.

SHOWING THE NUMBER, SIZE AND LENGTH OF SERVICES LAID IN 1888.

MONTH.	SIZE AND LENGTH OF PIPE.												TOTAL.	
	4-inch.		2-inch.		1½-inch.		1¼-inch.		1-inch.		¾-inch.			
	No.	Feet.	No.	Feet.	No.	Feet.	No.	Feet.	No.	Feet.	No.	Feet.	No.	Feet.
January	–	–	–	–	–	–	–	–	–	–	–	–	–	–
February	–	–	–	–	–	–	–	–	–	–	–	–	–	–
March	–	–	–	–	–	–	–	–	1	28.2	–	–	1	28.2
April	–	–	–	–	–	–	–	–	8	464.4	20	808.4	28	1,272.8
May	–	–	2	61.4	–	–	–	–	27	1,362.9	24	1,143.0	53	2,567.1
June	1	27.0	1	61.6	–	–	–	–	31	1,611.4	40	1,786.8	73	3,486.6
July	–	–	1	518.0	–	–	2	214.0	18	944.2	41	1,691.6	62	3,367.8
August	–	–	–	–	1	17.10	2	178.3	27	1,675.9	20	630.9	50	2,502.7
September	–	–	1	15.9	4	429.2	4	302.10	17	1,009.10	20	786.9	46	2,544.4
October	1	28.4	–	–	1	245.8	3	154.9	13	819.0	36	1,601.3	54	2,849.0
November	1	283.3	–	–	1	144.0	4	110.0	12	538.5	18	697.7	36	1,773.3
December	1	284.6	–	22.0	–	–	–	–	8	484.7	21	928.6	30	1,719.7
Totals	4	623.1	5	678.7	7	836.8	15	959.10	171	8,938.3	253	10,074.4	433	22,110.9

TABLE XI.

SHOWING THE LEAKS ON PIPES, HYDRANTS AND GATES, 1888.

MONTH.	SIZE OF MAINS.					SIZE OF SERVICES.	GATES.		Hydrants.
	12	10	8	6	4	1¼	8	6	
January	1	1	2	–	3	–	–	–	4
February	1	1	–	4	4	–	–	–	2
March	–	–	–	1	7	–	–	–	1
April	–	–	1	1	–	–	–	–	3
May	1	1	1	1	2	–	–	–	–
June	–	–	–	1	2	–	–	–	–
July	1	2	–	1	4	–	–	–	–
August	–	–	–	1	2	–	–	1	1
September	–	–	–	5	1	–	–	–	1
October	–	1	–	4	6	–	1	–	3
November	–	–	–	4	–	–	–	–	3
December	–	1	3	3	4	1	–	–	1
Totals	4	7	7	26	35	1	1	1	19

Meteorological Record for January, 1888.

Date.	8 A. M.		1 P. M.		6 P. M.		24 HOURS ENDING AT 8 P. M.				
	Barometer.	Thermometer.	Barometer.	Thermometer.	Barometer.	Thermometer.	Maximum Thermometer.	Minimum Thermometer.	Daily range.	Daily mean.	Rainfall.
1	30.11	35.0°	30.11	38.5°	30.10	47.5°	51.5°	35.5°	16.0°	43.5°	1.21
2	29.96	43.5	29.96	37.0	29.96	32.0	44.5	26.5	18.0	35.5	–
3	29.96	27.5	29.97	28.5	29.98	26.0	29.5	21.5	8.0	25.5	–
4	30.00	22.5	30.01	28 5	30.01	28.0	31.0	18.0	13.0	24.5	0.08
5	30.01	18.0	30.02	22.5	30.02	21.5	24.0	12.5	11.5	18.2	–
6	30.04	15.0	30.04	34.5	30.04	35.0	37.0	16.0	21.0	26.5	–
7	30.04	31.5	30.03	34.5	30.01	37.5	41.0	33.0	8.0	37.0	–
8	29.99	36 0	29.98	35.0	29.99	31.5	36.5	14.5	22.0	25.5	0.05
9	30.01	14.5	30.03	22.0	30.05	21.5	25.0	14.5	10.5	19.7	0.02
10	30.08	18.0	30.06	23.5	30.05	21.0	25.0	17.5	7.5	21.2	0.10
11	30.05	17.5	30 05	20.0	30.05	17.5	21 0	5.0	16.0	13.0	–
12	30.10	5.5	30.12	12.0	30.14	9.0	15.0	5.5	9.5	10.2	–
13	30.22	15.0	30.22	31.0	30.20	37.0	42.5	14.5	28.0	28.5	0.27
14	30.21	27.5	30.22	34.0	30.24	31.5	36.0	27.5	8.5	31.7	–
15	30.27	32.5	30.26	38.5	30.23	39.0	40 0	8.5	31.5	24.2	0.04
16	30.24	8.5	30.26	13.0	30.28	10.5	14.5	3.5	11.0	9.0	–
17	30.32	6.5	30 32	20.0	30.32	26.0	32.0	6.5	25.0	19.2	0.55
18	30.30	22.0	30.29	28.0	30 28	25.0	29 0	10.5	18.5	19.7	0.01
19	30.27	11.0	30.27	15.5	30.26	15.0	17.5	9.5	8.0	13.5	–
20	30.26	11.0	30.25	18.5	30.25	13.5	19.5	7.5	12.0	13.5	–
21	30.25	10.5	30.25	10.0	30.25	4.0	12.0	-3.5	15.5	4.2	–
22	30.27	-3.0	30.27	9.0	30.27	7.5	13.5	-3.0	16.5	5.2	–
23	30.27	1.0	30.27	18.0	30.27	19.0	22.5	3.0	19.5	12.7	0.03
24	30.25	12.0	30.25	16.5	30.26	7.0	19.5	-4.5	24.0	7.5	–
25	30.27	-2.5	30.27	16.0	30.26	20.0	37.0	-2.5	39.5	17.2	0.70
26	30.25	37.0	30.23	28.0	30.23	23.5	39.5	5.0	34.5	22.2	0.03
27	30.22	5.5	30.23	9.5	30.22	5.0	10.5	-2.5	13.0	4.0	–
28	30.22	-2.0	30.22	2.0	30.22	1.0	3.5	-5.0	8.5	-.75	–
29	30.22	-4.0	30.22	8.5	30.22	11.0	15.0	3.0	18.0	6.0	–
30	30.21	13.0	30.21	27.0	30.20	26.0	28.5	13.0	15.5	20.7	–
31	30.00	17.0	30.20	26.5	30.22	23.0	26.5	9.0	17.5	17.7	–

Monthly range . . . . 56.5°
Monthly mean . . . . 18.61°
Monthly rainfall 3.09

Meteorological Record for February, 1888.

	8 A. M.		1 P. M.		6 P. M.		24 HOURS ENDING 8 A. M.				
Date.	Barometer.	Thermometer.	Barometer.	Thermometer.	Barometer.	Thermometer.	Maximum Thermometer.	Minimum Thermometer.	Daily range.	Daily mean.	Rainfall.
1	30.20	11.0°	30.20	25.5°	30.20	25.0°	27.5°	11.0°	16.5°	19.2°	–
2	30.21	17.5	30.20	28.0	30.22	27.5	30.5	18.0	12.5	24.2	–
3	30.22	28.0	30.21	36.0	30.21	29.5	35.5	13.0	22.5	24.2	–
4	30.22	16.5	30.23	31.5	30.22	32.5	41.5	16.0	25.5	28.7	0.39
5	30.19	41.0	30.18	49.5	30.19	42.0	48.0	31.5	16.5	39.7	–
6	30.15	31.5	30.15	29.0	30.16	23.5	30.0	14.0	16.0	22.0	–
7	30.17	17.0	30.18	28.5	30.17	27.5	28.5	19.0	9.5	23.7	0.06
8	30.15	33.0	30.14	39.0	30.13	38.0	40.0	14.0	26.0	27.0	0.06
9	30.11	15.0	30.11	21.0	30.22	13.5	21.0	–2.0	23.0	9.5	–
10	30.13	0.0	30.13	12.0	30.14	12.0	13.0	0.0	13.0	6.5	0.10
11	30.14	13.0	30.13	19.0	30.12	21.0	25.5	12.5	13.0	19.0	0.45
12	30.13	20.5	30.13	29.5	30.14	24.5	30.0	20.0	10.0	25.0	–
13	30.13	26.0	30.14	38.0	30.14	35.0	38.5	27.0	11.5	32.7	–
14	30.14	33.5	30.13	46.5	30.12	42.5	49.5	33.5	16.0	41.5	–
15	30.12	33.5	30.24	19.5	30.33	7.5	33.5	–3.5	37.0	15.0	–
16	30.38	–1.5	30.33	9.5	30.25	13.0	23.5	–1.5	25.0	11.0	–
17	29.78	23.0	29.78	35.0	29.82	31.5	34.5	23.0	11.5	28.7	–
18	29.97	25.0	29.98	35.0	30.02	28.5	37.0	20.0	17.0	28.5	–
19	30.22	24.0	30.32	33.5	30.39	29.5	35.5	25.0	10.5	30.2	–
20	30.24	34.0	30.10	39.0	29.97	41.5	47.0	34.5	12.5	40.7	0.73
21	29.86	44.0	30.02	44.5	30.05	39.0	44.5	29.5	15.0	37.0	–
22	30.15	31.5	30.21	38.5	30.21	37.0	39.5	26.0	13.5	32.7	–
23	30.24	29.0	30.22	38.5	30.22	37.5	40.0	30.0	10.0	35.0	–
24	30.20	33.0	30.26	39.0	30.22	35.0	39.5	32.0	7.5	35.7	–
25	30.16	35.0	30.00	36.0	29.77	36.5	40.5	33.5	7.0	37.0	0.41
26	29.62	38.0	29.62	47.0	29.60	44.5	49.0	27.0	22.0	38.0	–
27	29.78	29.5	29.78	32.0	29.75	28.5	32.5	11.5	21.0	22.0	–
28	30.05	11.5	30.09	13.5	30.15	12.5	14.5	7.5	7.0	11.0	–
29	30.22	10.5	30.24	24.0	30.23	25.0	29.5	18.0	11.5	23.7	–

Monthly range	53.00°
Monthly mean	26.56°
Monthly rainfall	2.20

Meteorological Record for March, 1888.

	8 A. M.		1 P. M.		6 P. M.		24 HOURS ENDING 8 A. M.				
Date.	Barometer.	Thermometer.	Barometer.	Thermometer.	Barometer.	Thermometer.	Maximum Thermometer.	Minimum Thermometer.	Daily range.	Daily mean.	Rainfall.
1	30.32	21.5°	30.28	35.5°	30.26	33.5°	36.0°	15.5°	20.5°	25.7°	–
2	30.35	18.0	30.25	30.5	30.14	34.0	36.0	18.0	18.0	27.0	0.07
3	29.89	28.0	29.85	35.0	29.86	26.0	35.0	15.0	20.0	25.0	–
4	29.86	16.5	29.81	25.5	29.82	23.5	28.5	14.5	14.0	21.5	–
5	29.84	16.5	29.81	29.5	29.75	29.0	31.5	14.5	17.0	23.0	–
6	29.73	17.5	29.75	25.0	29.77	22.5	27.0	13.5	13.5	20.2	–
7	29.82	16.5	29.82	26.0	29.82	23.0	27.5	17.0	10.5	22.2	–
8	29.81	24.5	29.82	34.0	29.84	34.0	35.5	25.5	10.0	30.5	–
9	30.04	31.5	30.17	40.0	30.26	40.5	41.0	30.5	10.5	35.7	–
10	30.45	35.0	30.48	40.0	30.48	34.5	40.0	31.5	8.5	35.7	–
11	30.39	34.5	30.28	38.0	30.24	34.5	38.0	34.0	4.0	36.0	–
12	29.82	35.5	29.60	33.5	29.34	32.0	35.5	25.5	10.0	30.5	1.23
13	29.17	25.5	29.52	30.0	29.42	28.5	34.0	25.5	8.5	29.7	0.30
14	29.71	34.0	29.83	37.0	29.86	35.0	37.0	33.0	4.0	35.0	0.02
15	29.91	35.5	29.94	42.5	29.93	41.0	42.5	33.5	9.0	38.0	–
16	29.80	37.5	29.67	46.0	29.63	41.5	47.0	28.0	19.0	37.5	0.01
17	29.66	28.0	29.66	29.0	29.66	25.0	30.5	14.5	16.0	22.5	–
18	29.81	17.5	29.85	26.5	29.92	27.5	30.0	16.5	13.5	23.2	–
19	30.26	24.0	30.31	32.5	30.26	32.0	40.0	24.0	16.0	32.0	–
20	30.04	40.0	29.93	48.0	29.86	46.0	48.5	40.5	8.0	44.5	0.02
21	29.74	45.0	29.59	51.5	29.46	50.0	52.0	34.0	18.0	43.0	1.20
22	29.64	36.0	29.72	43.0	29.72	37.0	43.5	20.0	23.5	31.7	–
23	29.79	20.5	29.81	23.5	29.82	21.0	24.0	13.0	11.0	18.5	–
24	30.08	16.5	30.10	23.0	30.16	21.5	25.0	13.0	12.0	19.0	–
25	30.46	17.5	30.48	28.0	30.48	30.0	32.0	17.5	14.5	24.7	–
26	30.54	30.5	30.58	34.5	30.50	32.0	36.5	30.5	6.0	33.5	0.97
27	30.25	35.0	30.26	38.0	30.26	37.0	38.0	33.5	4.5	35.7	0.36
28	29.90	34.0	29.88	42.0	29.82	42.0	47.5	34.0	13.5	40.7	0.13
29	29.62	43.0	29.68	44.5	29.78	44.5	46.0	32.5	13.5	39.2	0.10
30	30.09	37.0	30.15	44.0	30.15	45.0	47.0	37.0	10.0	42.0	–
31	29.84	44.5	29.85	51.0	29.93	41.5	51.0	31.5	19.5	41.2	–

Monthly range . . . . 39.0°

Monthly mean . . . . 31.14°

Monthly rainfall 4.41

Meteorological Record for April, 1888.

	8 A. M.		1 P. M.		6 P. M.		24 HOURS ENDING 8 A. M.				
Date.	Barometer.	Thermometer.	Barometer.	Thermometer.	Barometer.	Thermometer.	Maximum Thermometer.	Minimum Thermometer.	Daily range.	Daily mean.	Rainfall.
1	30.02	36.0°	30.00	45.5°	29.87	44.5°	46.5°	34.0°	12.5°	40.2°	0.66
2	29.56	35.0	29.49	38.0	29.60	38.5	40 0	34.0	6.0	37 0	0.28
3	29.94	38.0	30 04	43.5	30.15	37.0	43.0	28 5	14.5	35.7	–
4	30.34	37.0	30.36	44.5	30.32	45.5	46.5	33.5	13 0	40.0	–
5	30.40	41.0	30.32	42.0	30.12	41.5	45.5	37.5	8.0	41.5	0.85
6	29.73	40.0	29.79	56.5	29.87	51.0	57.0	37.5	19.5	47.2	–
7	29 94	46.5	29 94	44.0	30.00	38.0	46.5	21.0	25.5	33.7	–
8	30.27	23.5	30.23	31.5	30.22	32.5	33.5	21.5	12.0	27.5	–
9	30.37	28 0	30.40	38.0	30.40	38.5	41 0	28.0	13.0	34.5	–
10	30.41	34.5	30.40	39.0	30.32	38.5	40.0	33.5	6.5	36.7	0.47
11	29.92	37.5	29.87	43.5	29.92	40.0	45 0	33.5	11.5	39.2	0.14
12	30.01	43.5	29.98	54.5	29.96	43.5	54.5	29 0	25.5	41.7	0.02
13	30.01	31.5	30.06	40.0	30.08	40.0	41.5	32 5	9.0	37.0	–
14	29.97	38.5	29.86	40.0	29.78	40.5	44.0	34.0	10.0	39.0	0.15
15	29.89	35.5	29.90	44.0	29.89	39.0	44.5	35.0	9.5	39.7	–
16	29.85	41.5	29.88	42.0	29.92	42.5	45.5	33.0	12.5	39.2	–
17	30.07	40.0	30.14	47.5	30.20	48.0	48.5	37.0	11.5	42.7	–
18	30.20	44 0	30 10	44.5	29.96	45.0	49.0	36.5	12.5	42.7	0.02
19	29.98	44.0	29 97	54.0	29.96	51.5	55.5	40.0	15.5	47.7	–
20	29.90	43.5	29 88	45.0	29.87	38.5	45.5	35.0	10.5	40.2	0.11
21	29.74	36.0	29 71	39 0	29.70	42.5	43.5	36.5	7.0	40.0	0.10
22	29.75	42.0	29.97	49.0	29.79	47.0	50.5	33.5	17 0	42.0	–
23	29.86	43.5	29.84	44.5	29.81	41.5	48 0	32.0	16.0	40.0	–
24	29.97	38.5	30.07	44.0	30.15	41.5	43.5	30.0	13.5	36.7	–
25	30.40	39.0	30.44	42.0	30 45	40.5	45.5	32.5	13.0	39.0	–
26	30.48	46.5	30.49	59.0	30 45	60.5	61 0	43.0	18.0	52.0	–
27	30 45	53.5	30 47	54.5	30.43	53.5	57.0	43.0	14.0	50.0	–
28	30.27	56.5	30.20	56.5	30.10	55.0	63.5	52.5	11.0	58.0	–
29	30.03	63.5	30.01	60.5	29 96	52.0	62.5	44.5	18.0	53.5	–
30	29.94	49.5	29.96	47.5	29.93	41.5	49.0	40.0	9.0	44.5	0.01

Monthly range	42.5°
Monthly mean	41.32°
Monthly rainfall	2.81

Meteorological Record for May, 1888.

	8 A. M.		1 P. M.		6 P. M.		24 HOURS ENDING 8 A. M.				
Date.	Barometer.	Thermometer.	Barometer.	Thermometer.	Barometer.	Thermometer.	Maximum Thermometer.	Minimum Thermometer.	Daily range.	Daily mean.	Rainfall.
1	29.75	42.0°	29.73	48.0°	29.76	42.5°	48.0°	35.5°	12.5°	41.7°	0.03
2	29.92	35.5	29.99	39.5	30.05	40.5	43.0	33.5	9.5	38.2	–
3	30.20	43.0	30.19	49.5	30.19	46.5	51.5	42.0	9.5	46.7	–
4	30.26	41.0	30.28	45.5	30.23	45.0	47.0	42.5	4.5	44.7	0.15
5	30.06	44.0	30.05	56.0	30.05	52.0	57.0	44.5	12.5	50.7	0.12
6	30.17	49.0	30.12	51.0	30.05	59.0	57.0	47.0	10.0	52.0	–
7	30.11	54.0	30.10	63.5	30.12	57.0	63.5	43.0	20.5	53.2	–
8	30.25	53.0	30.23	56.0	30.16	57.5	59.0	46.5	12.5	52.7	0.41
9	30.05	47.0	29.96	58.0	29.93	55.5	63.0	47.0	16.0	55.0	0.08
10	29.93	59.0	29.96	66.0	29.94	69.0	72.0	45.5	26.5	58.7	0.24
11	30.10	48.0	30.13	52.0	30.13	46.5	52.0	44.0	8.0	48.0	1.27
12	29.89	51.5	29.80	51.5	29.78	55.0	58.0	47.5	10.5	52.7	1.05
13	29.83	48.0	29.83	56.5	29.79	52.5	56.5	43.5	13.0	50.0	0.50
14	29.83	45.5	29.87	51.5	29.89	44.0	51.5	40.0	11.5	45.7	0.09
15	29.87	41.5	29.86	50.5	29.86	46.5	50.5	40.0	10.5	45.2	0.14
16	29.87	48.0	29.87	60.0	29.87	52.0	60.0	39.0	21.0	49.5	0.02
17	29.88	46.5	29.91	56.0	29.94	56.0	59.0	38.5	20.5	48.7	–
18	30.01	53.0	29.98	62.5	29.96	56.0	62.5	46.0	16.5	54.2	0.26
19	29.92	46.5	29.94	47.5	29.97	47.5	52.5	43.5	9.0	48.0	0.03
20	30.05	53.5	30.03	63.0	30.01	60.0	67.5	43.0	24.5	55.2	–
21	30.10	48.5	30.11	60.0	30.09	63.0	63.5	45.5	18.0	54.5	–
22	30.23	57.0	30.24	57.0	30.20	55.5	62.0	46.5	15.5	54.2	–
23	30.16	62.0	30.11	58.5	30.06	56.0	61.0	46.0	15.0	53.5	–
24	30.03	55.0	30.04	60.5	30.03	56.5	62.0	50.0	12.0	56.0	0.06
25	30.00	57.0	30.02	58.5	30.01	58.5	59.5	54.0	5.5	56.7	–
26	29.99	55.0	30.00	58.0	29.95	56.0	59.5	50.5	9.0	55.0	0.03
27	29.93	55.5	29.94	58.5	29.95	53.0	58.5	49.5	9.0	54.0	–
28	29.96	51.5	29.97	53.0	29.97	50.5	56.0	50.0	6.0	53.0	0.57
29	29.84	56.0	29.85	65.0	29.84	60.0	66.5	56.0	10.5	61.2	0.18
30	29.99	59.0	29.89	66.0	29.87	68.5	70.0	57.5	12.5	63.7	0.03
31	29.85	65.0	29.84	69.5	29.79	64.0	70.0	56.0	14.0	63.0	0.04

Monthly range	38.5°
Monthly mean	52.14°
Monthly rainfall	5.30

Meteorological Record for June, 1888.

	8 A. M.		1 P. M.		6 P. M.		24 HOURS ENDING 8 A. M.				
Date.	Barometer.	Thermometer.	Barometer.	Thermometer.	Barometer.	Thermometer.	Maximum Thermometer.	Minimum Thermometer.	Daily range.	Daily mean.	Rainfall.
1	29.65	64.0°	29.63	61.0°	29.63	68 5°	70 0°	46.0°	24.0°	58.0°	–
2	29.82	58.5	29.82	65.0	29.80	60.5	64.5	53.0	11.5	58.7	–
3	29.83	59.0	29.85	66.5	29.88	64.5	66.0	50.0	16.0	58.0	–
4	30.00	61.5	30.01	64.0	30.00	64.5	65.5	52.5	13.0	59 0	–
5	30.10	65.5	30.12	76.0	30.08	71.0	77.0	57.5	19.5	67.2	–
6	30.05	72.0	29.95	82.0	29.89	80.0	82.0	64.0	18.0	73.0	0.21
7	29.90	71.0	29.90	78.5	29.92	67.0	80.0	53.5	26.5	66.7	–
8	30.10	57.5	30.12	63.5	30.11	60.0	66.5	50.5	16.0	58.5	–
9	30.10	66.0	30.06	70.5	29.98	74.0	75.0	58.5	16.5	63.7	–
10	29.94	67.0	29.87	71.5	29.80	68.5	75.5	62.0	13.5	68.7	–
11	29.64	68.0	29.61	71.0	29 61	74.5	77.0	51.0	26.0	64.0	0.22
12	29 99	61.0	30.03	66.0	30.03	64.5	67.0	51.0	16.0	59.0	–
13	30.20	66.5	30.20	70.5	30.15	70.0	71.5	53.5	18.0	62.5	–
14	30.12	62.0	30.08	66.0	30.00	64 0	66.5	56.0	10.5	61.2	0.75
15	29.92	62.0	29.89	64.5	30.79	58.5	73.0	56.5	16.5	64.7	0.20
16	29.74	73.0	29.74	80 0	29.76	79.0	80.5	62.5	18.0	71.5	–
17	29.89	74.5	29.90	72.5	29.88	74.0	76.5	63.0	13.5	69.7	–
18	29.85	76.0	29.81	85.0	29.79	84.0	87.0	63.0	24.0	75.0	–
19	30.01	67.0	30.01	69.0	29.96	71.0	71.5	60.0	11.5	65.7	–
20	29.86	68.0	29.86	69.0	29 86	72.0	72.5	56.5	16.0	64.5	0.06
21	29.90	61.5	29.89	62.0	29.88	61.0	65.5	56.5	9.0	61.0	0.01
22	29.82	64.5	29.74	76.0	29.66	82.5	83.0	66.0	17.0	74.5	–
23	29.66	80.5	29.67	88.5	29.67	87.0	91.5	72.0	19.5	81 7	–
24	29.77	76.5	29.81	67.0	29.79	59.5	73.5	56.5	17.0	65.0	0.02
25	29.76	57.0	29.75	67.5	29.71	64.5	76.0	57.5	18.5	66.7	–
26	29.74	76.0	29.74	75.5	29.74	65.5	79.5	60.5	19.0	70.0	0.43
27	29.84	64.0	29.89	71.0	29.96	71.0	72.0	54.0	18.0	63.0	–
28	30.20	58.5	30.22	58.0	30.20	54.0	59.0	52.0	7.0	55.4	0.03
29	30.12	55.0	30.12	59.5	30.09	60.5	67.5	52.0	15.5	59.7	–
30	29.93	67.0	29.84	74.0	29.74	74.0	76.5	54.0	22.5	65.2	0.13

Monthly range . . . . 45.5°

Monthly mean . . . . 65.17°

Monthly rainfall 2.06

Meteorological Record for July, 1888.

	8 A. M.		1 P. M.		6 P. M.		24 HOURS ENDING 8 A. M.				
Date.	Barometer.	Thermometer.	Barometer.	Thermometer.	Barometer.	Thermometer.	Maximum Thermometer.	Minimum Thermometer.	Daily range.	Daily mean.	Rainfall.
1	29.77	57.5°	29.87	62.0°	29.92	59.0°	63.0°	52.0°	11.0°	57.5°	0.02
2	30.08	59.0	30.11	66.5	30.10	63.0	66.5	51.5	15.0	59.0	–
3	30.17	65.5	30.17	71.0	30.14	69.5	69.5	59.0	10.5	64.2	–
4	30.12	68.5	30.05	79.5	29.93	79.5	80.5	63.0	17.5	71.7	–
5	29.88	71.0	29.84	80.0	29.78	79.0	82.5	65.0	17.5	73.7	–
6	29.86	69.5	29.86	76.0	29.78	77.0	77.0	62.5	14.5	69.7	–
7	29.78	74.5	29.72	83.5	29.71	79.0	85.0	61.5	23.5	73.2	–
8	29.87	65.0	29.88	73.5	29.89	76.0	75.0	60.5	14.5	67.7	–
9	29.93	68.0	29.93	74.0	29.90	72.5	75.0	62.0	13.0	68.5	–
10	29.91	71.5	29.92	72.0	29.90	70.5	72.5	58.5	14.0	65.5	–
11	29.84	70.5	29.73	76.0	29.59	75.5	79.0	50.5	28.5	64.7	0.32
12	29.37	62.5	29.37	71.0	29.38	73.5	74.5	55.5	19.0	65.0	–
13	29.53	63.0	29.63	69.5	29.72	68.0	69.5	52.5	17.0	61.0	–
14	29.90	68.0	29.92	71.0	29.94	69.0	75.0	58.0	17.0	66.5	–
15	30.05	68.5	30.05	68.5	30.05	68.0	70.5	55.0	15.5	62.7	–
16	30.13	63.5	30.15	67.0	30.17	64.0	68.0	53.0	15.0	60.5	–
17	30.23	65.0	30.25	70.5	30.25	68.5	71.0	55.0	16.0	63.0	–
18	30.27	64.0	30.27	66.0	30.21	63.5	66.0	59.5	6.5	62.7	–
19	30.16	66.0	30.13	69.0	30.08	72.5	73.0	64.5	8.5	68.7	0.18
20	30.03	66.5	30.03	78.0	30.01	74.0	78.0	64.0	14.0	71.0	0.25
21	30.11	68.5	30.12	78.0	30.12	74.5	77.0	65.0	12.0	71.0	–
22	30.15	66.5	30.08	67.5	29.94	65.5	70.0	62.0	8.0	66.0	0.96
23	29.92	70.0	29.92	77.5	29.89	75.0	78.0	64.0	14.0	71.0	0.18
24	29.91	73.5	29.91	78.0	29.87	79.5	79.5	59.5	20.0	69.5	0.01
25	30.01	66.5	30.01	75.5	30.00	77.0	77.5	58.5	19.0	68.0	–
26	30.03	69.5	30.02	73.0	29.99	70.0	74.0	62.0	12.0	68.0	–
27	30.00	63.5	30.03	61.5	30.04	62.0	63.5	55.0	8.5	59.2	0.05
28	30.11	59.5	30.14	59.5	30.16	57.5	62.5	55.5	7.0	59.0	–
29	30.21	61.5	30.18	67.0	30.15	64.5	67.5	57.0	10.5	62.2	–
30	30.04	66.0	30.00	77.0	29.96	78.0	78.5	64.0	14.5	71.2	–
31	29.96	71.5	29.96	79.5	29.83	77.0	80.0	63.0	17.0	71.5	0.35

Monthly range	34.5°
Monthly mean	66.25°
Monthly rainfall	2.32

Meteorological Record for August, 1888.

	8 A. M.		1 P. M.		6 P. M.		24 HOURS ENDING 8 A. M.				
Date.	Barometer.	Thermometer.	Barometer.	Thermometer.	Barometer.	Thermometer.	Maximum Thermometer.	Minimum Thermometer.	Daily range.	Daily mean.	Rainfall.
1	29.90	64.0°	30.92	68.5°	29.89	68.0°	69.0°	60.0°	9.0°	64.5°	–
2	29.95	67.5	29.95	80.5	29.94	80.5	82.0	63.5	18.5	72.7	–
3	29.98	68.0	29.99	77.0	29.95	72.0	77.5	64.0	13.5	70.7	–
4	29.86	72.0	29.79	79.0	29.73	77.0	80.5	71.5	9.0	76.0	0.01
5	29.78	77.5	29.81	81.0	29.82	76.5	84.5	62.5	22.0	73.5	0.09
6	29.94	62.5	29.95	63.5	29.92	62.0	65.0	58.0	7.0	61.5	1.05
7	29.90	60.0	29.92	66.5	29.92	61.0	66.5	58.5	8.0	62.5	0.01
8	30.01	62.5	30.03	66.5	29.97	63.5	66.5	63.0	3.5	64.7	0.02
9	29.95	65.5	29.96	79.0	29.95	81.0	81.5	59.5	22.0	70.5	–
10	30.15	65.0	30.16	73.5	30.15	72.5	74.5	55.0	19.5	64.7	–
11	30.29	65.5	30.30	67.5	30.28	65.0	68.5	62.5	6.0	65.5	–
12	30.23	66.5	30.23	66.0	30.19	62.5	67.0	59.0	8.0	63.0	0.10
13	29.97	61.0	29.82	65.5	29.77	62.0	72.0	55.5	16.5	63,7	1.48
14	29.87	60.5	29.94	70.0	29.97	71.0	71.5	56.0	15.5	63.7	–
15	30.07	66.5	30.03	75.5	29.99	74.0	76.0	66.5	9.5	71.2	0.02
16	29.99	73.5	29.95	81.0	29.96	81.0	83.0	71.5	11.5	77.2	–
17	29.94	78.0	29.92	76.5	29.88	72.5	82.5	68.0	14.5	75.2	0.38
18	29.93	74.0	29.94	80.0	29.94	76.5	79.5	66.0	13.5	72.7	–
19	29.99	68.5	29.99	76.0	29.97	75.0	77.5	68.5	9.0	73.0	–
20	29.95	70.5	29.99	67.0	29.99	65.5	71.5	61.5	10.0	66.5	–
21	29.94	67.0	29.87	72.0	29.77	67.5	73.0	57.5	15.5	65.2	2.71
22	29.53	63.0	29.65	74.5	29.79	64.5	75.0	50.0	25.0	62.5	–
23	29.93	56.0	29.95	65.5	29.94	65.0	67.5	56.0	11.5	61.7	–
24	29.90	64.0	29.85	76.0	29.84	77.0	78.5	64.0	14.5	71.2	–
25	29.92	70.5	29.94	80.0	29.93	78.5	79.5	64.0	15.5	71.7	–
26	29.97	71.5	29.92	81.0	29.90	78.5	81.0	67.0	14.0	74.0	–
27	29.83	73.5	29.82	77.5	29.83	70.0	78.5	51.5	27.0	65.0	–
28	29.90	56.5	29.88	63.0	29.88	61.0	62.5	52.0	10.5	57.2	–
29	29.88	60.0	29.85	71.5	29.83	68.5	72.0	57.0	15.0	64.5	–
30	29.87	68.0	29.87	77.0	29.88	76.0	78.0	61.0	17.0	69.5	–
31	29.98	69.0	29.97	74.5	29.94	73.0	75.5	63.5	12.0	69.5	0.06

Monthly range	34.05°
Monthly mean	67.93°
Monthly rainfall	5.93

Meteorological Record for September, 1888.

	8 A. M.		I. P. M.		6. P. M.		24 HOURS ENDING 8 A. M.				
Date.	Barometer.	Thermometer.	Barometer.	Thermometer.	Barometer.	Thermometer.	Maximum Thermometer.	Minimum Thermometer.	Daily range.	Daily mean.	Rainfall.
1	29.78	67.0°	29.75	70.0°	29.79	68.5°	74.5°	64.5°	10.0°	69.5°	0.11
2	29.97	66.0	30.01	71.5	30.08	64.0	71.5	54.0	17.5	62.7	–
3	30.25	62.0	30.27	64.5	30.25	61.5	65.0	60.0	5.0	62.5	0.01
4	30.21	63.0	30.12	62.5	30.07	58.0	65.5	57.0	8.5	61.2	0.01
5	29.98	64.0	30.04	70.0	30.10	60.0	71.0	41.5	29.5	56.2	–
6	30.41	46.0	30.47	54.5	30.48	51.5	55.0	40.0	15.0	47.5	–
7	30.59	50.0	30.61	55.0	30.57	53.5	58.0	50.5	7.5	54.2	–
8	30.34	58.0	30.14	67.5	30.06	68.5	69.0	58.5	10.5	63.7	0.83
9	30.00	68.5	29.99	73.0	29.94	68.0	73.0	64.0	9.0	68.5	0.27
10	29.81	65.5	29.86	76.0	29.95	68.5	76.0	54.0	22.0	65.0	–
11	30.14	58.0	30.16	67.0	30.12	61.5	67.0	52.0	15.0	59.5	0.35
12	29.88	58.5	29.83	61.5	29.82	62.0	63.5	59.0	4.5	61.2	0.20
13	29.85	63.5	29.85	68.5	29.86	59.5	68.5	44.0	24.5	56.2	–
14	30.04	48.5	30.05	63.5	30.07	62.5	66.0	46.5	19.5	56.2	–
15	30.23	54.0	30.26	61.5	30.26	58.5	60.5	53.5	7.0	57.0	–
16	30.27	59.5	30.22	64.0	30.09	61.0	67.0	59.0	8.0	63.0	0.06
17	29.98	67.0	30.02	75.0	30.07	65.5	75.0	56.5	18.5	65.7	1.05
18	30.71	58.0	30.06	59.5	30.06	54.0	60.0	53.0	7.0	56.5	0.75
19	30.11	54.5	30.10	59.0	30.10	56.5	59.0	54.5	4.5	56.7	0.03
20	30.12	57.5	30.12	59.5	30.10	58.0	60.0	56.0	4.0	58.0	0.21
21	30.05	56.5	30.01	56.5	29.97	57.0	57.0	52.0	5.0	54.5	0.89
22	29.98	53.0	30.01	59.5	30.02	56.0	59.5	49.5	10.0	54.5	0.04
23	30.08	54.0	30.11	56.5	30.14	54.0	55.0	48.0	7.0	51.5	–
24	30.19	52.5	30.20	54.5	30.19	49.5	54.5	38.5	16.0	46.5	–
25	30.11	46.5	30.02	55.5	29.98	52.5	54.5	49.0	5.5	51.7	1.10
26	29.51	47.5	29.30	47.5	29.44	55.0	55.0	44.0	11.0	49.5	2.10
27	29.70	56.0	29.71	68.0	29.74	62.0	68.0	52.5	15.5	60.2	0.02
28	29.85	52.5	29.84	61.0	29.84	53.5	61.5	37.0	24.5	49.2	0.01
29	29.96	40.5	29.95	52.0	29.96	45.0	51.5	34.5	17.0	43.0	–
30	29.97	42.0	29.92	50.5	29.90	46.0	51.0	33.5	17.5	42.2	–

Monthly range	42.5°
Monthly mean	56.82°
Monthly rainfall	8.04

Meteorological Record for August, 1888.

	8 A. M.		1 P. M.		6 P. M.		24 HOURS ENDING 8 A. M.				
Date.	Barometer.	Thermometer.	Barometer.	Thermometer.	Barometer.	Thermometer.	Maximum Thermometer.	Minimum Thermometer.	Daily range.	Daily mean.	Rainfall.
1	29.90	64.0°	30.92	68.5°	29.89	68.0°	69.0°	60.0°	9.0°	64.5°	–
2	29.95	67.5	29.95	80.5	29.94	80.5	82.0	63.5	18.5	72.7	–
3	29.98	68.0	29.99	77.0	29.95	72.0	77.5	64.0	13.5	70.7	–
4	29.86	72.0	29.79	79.0	29.73	77.0	80.5	71.5	9.0	76.0	0.01
5	29.78	77.5	29.81	81.0	29.82	76.5	84.5	62.5	22.0	73.5	0.09
6	29.94	62.5	29.95	63.5	29.92	62.0	65.0	58.0	7.0	61.5	1.05
7	29.90	60.0	29.92	66.5	29.92	61.0	66.5	58.5	8.0	62.5	0.01
8	30.01	62.5	30.03	66.5	29.97	63.5	66.5	63.0	3.5	64.7	0.02
9	29.95	65.5	29.96	79.0	29.95	81.0	81.5	59.5	22.0	70.5	–
10	30.15	65.0	30.16	73.5	30.15	72.5	74.5	55.0	19.5	64.7	–
11	30.29	65.5	30.30	67.5	30.28	65.0	68.5	62.5	6.0	65.5	–
12	30.23	66.5	30.23	66.0	30.19	62.5	67.0	59.0	8.0	63.0	0.10
13	29.97	61.0	29.82	65.5	29.77	62.0	72.0	55.5	16.5	63.7	1.48
14	29.87	60.5	29.94	70.0	29.97	71.0	71.5	56.0	15.5	63.7	–
15	30.07	66.5	30.03	75.5	29.99	74.0	76.0	66.5	9.5	71.2	0.02
16	29.99	73.5	29.95	81.0	29.96	81.0	83.0	71.5	11.5	77.2	–
17	29.94	78.0	29.92	76.5	29.88	72.5	82.5	68.0	14.5	75.2	0.38
18	29.93	74.0	29.94	80.0	29.94	76.5	79.5	66.0	13.5	72.7	–
19	29.99	68.5	29.99	76.0	29.97	75.0	77.5	68.5	9.0	73.0	–
20	29.95	70.5	29.99	67.0	29.99	65.5	71.5	61.5	10.0	66.5	–
21	29.94	67.0	29.87	72.0	29.77	67.5	73.0	57.5	15.5	65.2	2.71
22	29.53	63.0	29.65	74.5	29.79	64.5	75.0	50.0	25.0	62.5	–
23	29.93	56.0	29.95	65.5	29.94	65.0	67.5	56.0	11.5	61.7	–
24	29.90	64.0	29.85	76.0	29.84	77.0	78.5	64.0	14.5	71.2	–
25	29.92	70.5	29.94	80.0	29.93	78.5	79.5	64.0	15.5	71.7	–
26	29.97	71.5	29.92	81.0	29.90	78.5	81.0	67.0	14.0	74.0	–
27	29.83	73.5	29.82	77.5	29.83	70.0	78.5	51.5	27.0	65.0	–
28	29.90	56.5	29.88	63.0	29.88	61.0	62.5	52.0	10.5	57.2	–
29	29.88	60.0	29.85	71.5	29.83	68.5	72.0	57.0	15.0	64.5	–
30	29.87	68.0	29.87	77.0	29.88	76.0	78.0	61.0	17.0	69.5	–
31	29.98	69.0	29.97	74.5	29.94	73.0	75.5	63.5	12.0	69.5	0.06

Monthly range	34.05°		
Monthly mean		67.93°	
Monthly rainfall			5.93

Meteorological Record for September, 1888.

	8 A. M.		1. P. M.		6. P. M.		24 HOURS ENDING 8 A. M.				
Date.	Barometer.	Thermometer.	Barometer.	Thermometer.	Barometer.	Thermometer.	Maximum Thermometer.	Minimum Thermometer.	Daily range.	Daily mean.	Rainfall.
1	29.78	67.0°	29.75	70.0°	29.79	68.5°	74.5°	64.5°	10.0°	69.5°	0.11
2	29.97	66.0	30.01	71.5	30.08	64.0	71.5	54.0	17.5	62.7	–
3	30.25	62.0	30.27	64.5	30.25	61.5	65.0	60.0	5.0	62.5	0.01
4	30.21	63.0	30.12	62.5	30.07	58.0	65.5	57.0	8.5	61.2	0.01
5	29.98	64.0	30.04	70.0	30.10	60.0	71.0	41.5	29.5	56.2	–
6	30.41	46.0	30.47	54.5	30.48	51.5	55.0	40.0	15.0	47.5	–
7	30.59	50.0	30.61	55.0	30.57	53.5	58.0	50.5	7.5	54.2	–
8	30.34	58.0	30.14	67.5	30.06	68.5	69.0	58.5	10.5	63.7	0.83
9	30.00	68.5	29.99	73.0	29.94	68.0	73.0	64.0	9.0	68.5	0.27
10	29.81	65.5	29.86	76.0	29.95	68.5	76.0	54.0	22.0	65.0	–
11	30.14	58.0	30.16	67.0	30.12	61.5	67.0	52.0	15.0	59.5	0.35
12	29.88	58.5	29.83	61.5	29.82	62.0	63.5	59.0	4.5	61.2	0.20
13	29.85	63.5	29.85	68.5	29.86	59.5	68.5	44.0	24.5	56.2	–
14	30.04	48.5	30.05	63.5	30.07	62.5	66.0	46.5	19.5	56.2	–
15	30.23	54.0	30.26	61.5	30.26	58.5	60.5	53.5	7.0	57.0	–
16	30.27	59.5	30.22	64.0	30.09	61.0	67.0	59.0	8.0	63.0	0.06
17	29.98	67.0	30.02	75.0	30.07	65.5	75.0	56.5	18.5	65.7	1.05
18	30.71	58.0	30.06	59.5	30.06	54.0	60.0	53.0	7.0	56.5	0.75
19	30.11	54.5	30.10	59.0	30.10	56.5	59.0	54.5	4.5	56.7	0.03
20	30.12	57.5	30.12	59.5	30.10	58.0	60.0	56.0	4.0	58.0	0.21
21	30.05	56.5	30.01	56.5	29.97	57.0	57.0	52.0	5.0	54.5	0.89
22	29.98	53.0	30.01	59.5	30.02	56.0	59.5	49.5	10.0	54.5	0.04
23	30.08	54.0	30.11	56.5	30.14	54.0	55.0	48.0	7.0	51.5	–
24	30.19	52.5	30.20	54.5	30.19	49.5	54.5	38.5	16.0	46.5	–
25	30.11	46.5	30.02	55.5	29.98	52.5	54.5	49.0	5.5	51.7	1.10
26	29.51	47.5	29.30	47.5	29.44	55.0	55.0	44.0	11.0	49.5	2.10
27	29.70	56.0	29.71	68.0	29.74	62.0	68.0	52.5	15.5	60.2	0.02
28	29.85	52.5	29.84	61.0	29.84	53.5	61.5	37.0	24.5	49.2	0.01
29	29.96	40.5	29.95	52.0	29.96	45.0	51.5	34.5	17.0	43.0	–
30	29.97	42.0	29.92	50.5	29.90	46.0	51.0	33.5	17.5	42.2	–

Monthly range . . . . 42.5°

Monthly mean . . . . 56.82°

Monthly rainfall 8.04

Meteorological Record for October, 1888.

	8 A. M.		I P. M.		6. P. M.		24 HOURS ENDING 8 A. M.				
Date.	Barometer.	Thermometer.	Barometer.	Thermometer.	Barometer.	Thermometer.	Maximum Thermometer.	Minimum Thermometer.	Daily range.	Daily mean.	Rainfall.
1	29.87	40.0°	29.78	49.5°	29.70	52.0°	56.0°	41.0°	15.0°	48.5°	0.43
2	29.44	54.0	29.46	55.0	29.48	51.5	58.5	39.0	19.5	48.7	0.35
3	29.65	40.5	29.68	48.0	29.74	43.5	36.0	33.0	3.0	34.5	0.02
4	29.99	37.0	30.01	48.5	30.02	47.0	52.5	37.5	15.0	45.0	–
5	30.04	52.5	29.97	64.5	29.96	58.0	65.0	52.5	12.5	58.7	0.02
6	29.99	55.5	29.95	53.5	29.90	52.0	60.0	52.0	8.0	56.0	0.96
7	29.59	59.5	29.47	57.5	29.45	55.0	59.0	47.5	11.5	53.2	0.33
8	29.34	50.0	29.30	55.5	29.31	48.0	56.5	40.0	16.5	48.2	–
9	29.48	40.0	29.54	44.0	29.64	36.5	45.5	34.5	11.0	40.0	–
10	29.74	39.0	29.77	44.5	29.84	40.5	45.0	32.5	12.5	38.7	–
11	29.90	37.5	29.89	51.0	29.89	48.0	51.5	38.0	13.5	44.7	–
12	29.88	48.0	29.86	48.5	29.84	47.0	49.5	47.0	2.5	48.2	0.22
13	29.67	49.0	29.69	53.5	29.73	43.5	53.5	39.5	14.0	46.5	0.10
14	29.82	39.5	29.83	41.5	29.84	41.0	42.0	34.0	8.0	38.0	0.01
15	29.91	38.5	29.93	50.0	29.93	47.5	51.5	37.5	14.0	44.5	–
16	30.02	41.5	30.03	55.0	30.00	52.5	55.0	42.5	12.5	48.7	0.01
17	29.97	50.0	29.93	57.5	29.86	47.5	57.5	41.5	16.0	49.5	0.08
18	29.95	43.0	29.96	50.0	30.00	43.0	40.0	33.0	7.0	36.5	–
19	30.07	40.0	30.01	49.0	29.96	46.0	51.0	41.0	10.0	46.0	0.46
20	29.67	45.0	29.70	54.0	29.72	50.0	54.0	37.0	17.0	45.5	–
21	29.85	41.0	29.86	46.5	29.99	37.5	46.0	32.0	14.0	39.0	–
22	30.10	34.5	30.13	46.0	30.13	43.0	47.0	35.0	12.0	41.0	–
23	30.10	38.5	30.01	54.0	29.95	51.0	54.5	40.0	14.5	47.2	0.27
24	29.73	49.0	29.65	47.5	29.76	43.0	49.5	38.5	11.0	44.0	0.74
25	30.13	41.5	30.17	49.5	30.22	47.0	50.0	33.5	16.5	41.7	–
26	30.39	36.5	30.47	46.0	30.48	43.5	50.0	33.5	16.5	41.7	0.02
27	30.42	48.5	30.32	51.5	30.24	50.5	53.0	49.0	4.0	51.0	0.43
28	29.91	53.5	29.74	61.0	29.62	58.5	61.0	40.5	20.5	50.7	0.06
29	29.65	42.5	29.66	48.5	29.68	46.0	48.0	35.5	12.5	41.7	–
30	29.90	36.5	30.00	42.5	30.13	39.0	42.5	33.0	9.5	37.7	–
31	30.30	38.5	30.23	53.0	30.19	51.5	54.0	39.5	14.5	46.7	–

Monthly range	33.0°
Monthly mean	45.25°
Monthly rainfall	4.51

Meteorological Record for November, 1888.

	8 A. M.		1 P. M.		6 P. M.		24 HOURS ENDING 8 A. M.				
Date.	Barometer.	Thermometer.	Barometer.	Thermometer.	Barometer.	Thermometer.	Maximum Thermometer.	Minimum Thermometer.	Daily range.	Daily mean.	Rainfall.
1	30.22	51.5°	30.22	63.5°	30.22	58.0°	66.5°	48.5°	18.0°	57.5°	-
2	30.19	51.5	30.05	66.5	30.98	61.0	66.5	52.0	14.5	59.2	-
3	29.79	58.0	29.68	61.5	29.72	51.5	64.5	40.0	24.5	52.2	0.03
4	30.09	42.5	30.12	51.5	30.20	47.0	52 5	42.5	10.0	47.5	-
5	30.27	46.5	30.22	58.0	30.20	52.0	58.0	47.0	11.0	52.5	-
6	30.03	58.0	29.90	66.5	29.87	61.0	66.0	36.0	30.0	51.0	-
7	29.94	56.0	30 05	53.5	30.20	46.0	55.0	35.5	19.5	45.2	-
8	30.42	41.5	30.46	43.0	30.42	44.5	48.5	41.5	7.0	45.0	0.23
9	29.96	48.5	29.87	63.0	29.86	62.0	63.0	44.0	19.0	53.5	0.49
10	29.88	45.0	29.74	43 5	29.57	44.5	48.5	42.0	6.5	45.2	0.60
11	29.55	44.0	29.59	45.5	29.77	39.0	48.0	35.0	13.0	41.5	-
12	29.96	39.5	30.02	47.0	30.17	38.0	47 5	24.0	23.5	35.7	-
13	29.48	26.5	30.53	38.0	30.51	39.5	41.0	27.5	13.5	34.2	-
14	29.42	41.0	29.32	58.5	29.31	51.0	58.5	39.5	19.0	49.0	-
15	30.14	46.0	29.92	50.5	29.62	50.0	50.5	45.5	5.0	48.0	0.71
16	29.72	48.5	29.72	59.5	29.82	44.0	61.5	32.5	29.0	47.0	0.12
17	30.11	34.0	30.19	42.0	30.32	36.0	41.5	25.0	16.5	33.2	-
18	30.73	26.0	30.75	32.5	30.74	34.0	43.0	26 0	17.0	34.5	-
19	30.50	43.0	30.31	46.0	30.06	48.5	51.5	34.5	17.0	43.0	0.34
20	30.20	34.5	30.28	36.0	30.41	27.5	36.5	14.0	22.5	25.2	-
21	30.55	15.0	30.58	27.0	30.54	24.0	27.5	15.5	12.0	21.5	-
22	30.42	21 0	30.43	31.5	30.48	27.0	31.5	12.0	19.5	21.7	-
23	30.65	14.5	30.70	23.5	30.69	22.5	27.5	14.0	13.5	20.7	-
24	30.64	26.5	30.57	33.0	30.52	33.0	34.0	28.0	6.0	31.0	0.10
25	30.26	32.5	30.06	29.0	29.95	32.5	41.0	29.0	12.0	35.0	2.35
26	29.53	41.0	29.47	45.5	29.45	46.0	47.0	40.5	6.5	43.7	0.75
27	29.44	47.0	29.43	47 0	29.34	45.0	47.0	39.0	8.0	43.0	0.62
28	29.65	41.0	29.67	47.5	29.70	46.0	48.0	35.0	13.0	41.5	-
29	29.69	36.0	29.63	40.0	29.62	39.0	40.5	37.0	3.5	38.7	0.18
30	29.62	37.5	29.64	43.0	29.67	41.0	43.5	37.5	6.0	40.5	-

Monthly range	54.5°
Monthly mean	41.266°
Monthly rainfall	6.52

1912

EIGHTEENTH ANNUAL REPORT

OF THE

PUBLIC WATER BOARD

OF THE

CITY OF LYNN,

FOR THE YEAR ENDING DECEMBER 31, 1889.

LYNN, MASS.:
JOHN F. MCCARTY & BRO., PRINTERS,
NO. 44 MUNROE STREET.
1890.

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OFFICERS FOR 1889.

DAVID KNOX, *President*,
For two years.

ALFRED A. MOWER,
For one year.

EDWIN BATES,
For three years.

E. B. BILLINGS,
For four years.

QUINCY A. TOWNS,
For five years.

Superintendent and Clerk—JOHN C. HASKELL.
Water Registrar—WALLACE O. MUDGE.
Pumping Engineer—W. H. MESSINGER.
Foreman of Piping—EDWIN MAXWELL.
Foreman of Services—HENRY WHEELOCK.
Inspectors—WINSLOW J. ROWELL, W. B. MOULTON, J. FRANK POOL

PUBLIC WATER BOARD FOR 1890.

DAVID KNOX, for one year.
EDWIN BATES, for two years.
EDWARD B. BILLINGS, for three years,
QUINCY A. TOWNS, for four years.
W. B. LITTLEFIED, for five years.

ANNUAL REPORT.

OFFICE OF THE PUBLIC WATER BOARD,
January 1, 1890.

To the Honorable Mayor and City Council of the City of Lynn:

The Public Water Board hereby presents to the City Council its eighteenth annual report, together with the report of the Superintendent and Registrar.

These reports detail in full the practical workings of the department, besides giving much information and many tables of general interest.

The Board stood confronted at the beginning of the year with conditions that demanded its most serious consideration. Mr. D. H. Sweetser, having for seventeen years given his services to the city as a member of this Board, and having, as its president for five years, in his immediate personal care its varied and multitudinous interests, had decided to retire, and positively declined a renomination, to the great regret of all his associates on the Board.

At the same time, the late Mr. Daniel Walden, who for sixteen years has been superintendent, felt that his fast failing health imperatively demanded that he also should lay down the cares and responsibilities of official position, which, as the fatal results showed, he should have done long before, his death occurring only four weeks after his resignation.

Thus the Board was deprived at once of the great experience, the good judgment, the untiring zeal and sterling honesty of the oldest and most experienced members of its officiary. At the same time, the Board was commencing work on the construction and extension of the service, greater in magnitude than had ever before been necessary. It had been decided to proceed with the new ponds in Penny Brook valley. This work would require constant and careful oversight, and would involve the settlement of a great many claims for land damages, which could only be satisfactorily accomplished by the expenditure of a vast amount of time and patience.

The Board had also decided to replace the old cement lined with new and larger cast iron mains. The heavy damages and expensive repairs caused by the frequent bursting of the old pipes convinced the Board that no time should be lost in beginning this work, which should be continued from year to year, until all the rust-eaten and rotten pipes which are a constant menace to the city, shall have been replaced. A work requiring the best of judgment and careful management; so that in its prosecution through streets interlaced with horse, electric or steam car rails, and lined largely by factories whose works require a constant supply of water for their operations, the work should be so done as to cause as little delay as possible to public travel, and to prevent as much as possible the shutting down of factories by cutting off their water supply.

Very fortunately for the city, the Board had succeeded in securing the services of Engineer George H. Bishop, to have charge of the work on the new supply; his long experience as a constructing engineer, and his intimate acquaintance with our water system from its first inception, particularly quulified him for this position.

Equally fortunate was the Board in securing as superintendent of the city works, Engineer John C. Haskell. Mr. Haskell assisted Mr. Kirkwood in making the original surveys for these works, and his intimate acquaintance with the whole water system, as well as his long experience in street work, make his services of great value to the city.

OUR NEW SUPPLY.

It would be difficult, if not impossible, to convey to the minds of those not acquainted with the original condition of the Blood swamp and Pennry Brook valley, any adequate idea of the work involved in the construction of the new basins. A wild, dreary, tangled swamp has, by the magic touch of toil, been so changed that when the valley is filled with water, there will be two beautiful ponds, surrounded by scenery of the most delightful description. The drive, winding picturesquely along the borders of the ponds gives our citizens ample facilities for enjoying this beautiful scenery; and these works, in connection with the Free Public Forest, on which they border, will be to our people a source of ever increasing delight.

There is, in fact there can be, nothing so vitally important to the well-being of the City, as a water supply plenteous for its present growing needs, and absolutely secured from the poisoning touch of filth and polution. Such a great blessing has Lynn secured in the present System of Ponds, by the City Government purchasing for a Free Public Forest the territory constituting the water-shed of these ponds.

As the years roll on, the population of City and State rapidly increasing, the sources of a pure water supply will become of more and more consequence to the good health and well-being of the people; and the wise foresight of having accomplished this good work, and securing to our children and our children's children these precious blessings will be fully vindicated.

It being late in the season before the Board was able to secure the services of Mr. Bishop, but little could be done on the work last year, except to have the preliminary surveys made, defining the flowage line, so that the land might be condemned and taken. This was done and the wood standing sold, to be cut and removed before spring. In the latter part of March work was recommenced. It had been decided to build two dams in the valley, one at the lower end, and a shorter one at the narrow gorge at Glen Lewis. If only the main dam had been constructed there would have been a long, narrow sheet of shallow water at the upper or Blood Swamp end, which, in the hot months of summer, would have become foul with growing vegetable matter, endangering the purity and wholesomeness of the whole pond. By the construction of the upper dam a sufficient depth of water is maintained to assure perfect freedom from any danger of this character. There has also been constructed a substantial road-way the entire length of the valley from Walnut Street in Saugus to Forest Garden Avenue in Lynn.

It has always been expected that the construction of these ponds would extend over two seasons, but with such ability and energy has the work been directed that the whole has been completed within the year, and such has been the care exercised in the management of the work, that, with one exception, no casualty of any consequence has occurred during the entire construction, and for this exception, which was purely accidental, no one was to be blamed.

THE DAMS.

The main dam is an earthen structure with a centre cut-off wall of puddled clay. The length of the dam is twelve hundred and seventy-five feet, the width at the base is one hundred feet, and at the top is sixteen feet. The height of the dam above the bottom of pond is twenty-one feet. The surface soil to an average depth of five feet was removed the entire length, a trench four feet wide dug throughout the centre to an average depth of fifteen feet, and in this was laid the foundation of puddled clay, which has been carried up in the centre of the dam to within two feet of the top. In the construction of this cut-off wall, five thousand five hundred cubic yards of clay were used which had to be hauled a distance of three miles, none having been found, after careful borings, at a nearer point; this added very materially to the cost of the work.

The area of the front slope of the dam is six thousand five hundred yards, and the whole is covered with heavy paving. The back slope is covered with fine soil to the depth of two feet and sowed with grass. The length of the overflow is eighty feet and is covered with nine hundred yards of paving. With the exception of the clay and cement all the materials needed in the construction of the works were found on the ground in great abundance.

The Upper Dam is three hundred and thirty feet long. As the cost of hauling clay to this point would have been very great, it was decided to lay a heavy stone wall in cement. The area of this wall is eight hundred square yards. The front slope is a heavy riprap of stone. The overflow is twenty-five feet wide, and of the most substantial character.

LAND DAMAGES.

So discordant generally are the views entertained by the owners as to the value of the property condemned, from the opinions of the Board that the question of land damages has always been approached with dread. There seems a very general expectation that if land is taken for city uses, much more should be asked than if a private individual were making the purchase, and perhaps for the purpose of water storage this may to some degree be admitted to be true. The Board recognizing this, at the outset of the work fixed on each lot a generous value, and would in no case pay an unreasonable or exorbitant price above the market value, and they are pleased to report that a settlement has been effected with all the owners of the land, with two or three insignificant exceptions. The land covered by the area of the ponds is one hundred and sixty-four acres, divided into forty parcels, having some fifteen or twenty owners. Under the authority given by the City Government, one hundred and thirty four additional acres lying on the water-shed have also been purchased, so that purity from contamination may be preserved,

PUMPING PLANT AND MAINS.

It has been for some time evident to the Board that it would be unwise to rely longer on the Leavitt engine. The Dean being quite insufficient in case an accident happened to the larger pump, investigations have been made looking to the purchase of a larger engine. Under authority of the City Government, a contract has been made with A. J. L. Loretz, of Brooklyn, N. Y., for one of his latest improved high duty pumping engines of ten million gallons capacity, which he has agreed to deliver by the first of next July. This will necessitate laying a larger force main to the reservoir. The old force main will be utilized as the beginning of a new main to run down to the centre of the city. This work will be commenced and carried forward with all possible despatch.

INSPECTION.

The gratifying result of the year's work in the increased revenue is largely due to the faithful manner with which our inspectors have performed their onerous duties. No doubt their visits may seem to some of our citizens very inquisitorial, but a moment's reflection only is necessary to enable them to realize that if one person gets water privileges for which they do not pay, it is an injustice to every other taker who does pay, and the one purpose of our continual inspection is that all persons taking water shall be treated just alike.

FINANCIAL.

It will be seen by the Treasurer's report that this department has turned over to the water loan sinking fund this year $61,843.83 ; of this $18,000 is from premiums and accrued interest. The Board have endeavored to run the department with the strictest regard to economy, in order to hasten the time when they might with safety recommend a further reduction in the rates, but it seems probable that on account of the recent great fire, the revenue of the coming year may be materially reduced, while the interest account will be largely increased, because of the heavy expenditures for the new works ; and until the extent of reduction is ascertained, the Board refrains from advising any changes.

PETITIONS FOR STREET MAINS.

Again the Board would call the attention of the City Council to the cumbersome and dilatory method of answering the calls of our citizens for new mains, or the extension of old ones. The petition is addressed to the City Council, who refer it to the Committee on Water Supply; they in turn refer it to the Water Board for information as to the facts in the case. The Board makes the necessary investigation, and report back to the Committee with a recommendation. The Committee reports back to the Council, and after a long, and sometimes an injurious delay, the order is passed. The Water Board is certainly the proper place to which all these petitions should be addressed, and authority should be conferred on the Board to determine what action shall be taken on the petitions. This is substantially true now, as the Government acts on the Board's recommendation, and the only effect which the present round-about method has, is to cause much vexatious delay.

STAND PIPES.

It is becoming a common practice to have in our large factories, mills and stores, stand pipes connected with a sprinkling service, or private hydrants upon the premises. These pipes and hydrants are not a source of any revenue, no rates having ever been established. The parties having them are directly and immediately benefitted in a reduced rate of insurance. When hydrants are placed on our mains for protection from fire, the ordinances provide that a revenue shall be paid for each hydrant, and justly so; and certainly if the general public should pay for that which is a general benefit, no good reason exists why individuals should not pay when they are personally and directly benefitted.

The Board seriously questions the prudence of having 4-inch stand pipes connected with our service at all, as three or four of these pipes could conduct more water than many of our mains could supply; and the free flow of water from these pipes would thus seriously endanger the efficiency of the water service. This liability is evident in case of the destruction by fire of two or three adjacent buildings equipped with sprinkling services. The Board, after careful consideration, will fix upon a rate for these stand pipes and private hydrants, which will be submitted, at an early date, to the City Council for their approval.

For the Water Board,

David Knox *President.*

REPORT OF THE WATER REGISTRAR.

To David Knox, Esq., President Public Water Board:

Sir,—I herewith present the financial condition of the department, for the year ending December 31, 1889.

RECEIPTS.

Fixture rates		$97,047 77
Meter rates		23,141 05
Additional rates		2,517 19
Fines and summons		178 80

MISCELLANEOUS.

Repairs	$369 77	
Building purposes	301 30	
Fire purposes (Saugus)	224 00	
Sale of horse	200 00	
Sale of grass	23 00	
Turning on services	18 00	
Use of seal locks	16 50	
Interest	13 00	
Rent of pasture	12 50	
Flushing sewers	10 63	
Filling cisterns	7 00	
Sale of junk	5 50	
Sale of boat	2 00	
		$1,203 20
Total revenue		$124,688 01
Extra pipe and labor		6,371 20
Sale of wood (New Basin)		523 00
Total receipts, as per cash-book		$131,582 21

The City Council saw fit to cut off the revenue, for water furnished the city, as provided under the rates approved September 8, 1885, and appropriated to the Water Loan Sinking Fund, the sum of fifteen thousand dollars ($15,000). I have continued to charge, under the established rates, as the same have not been annulled, said amounts aggregating $18,796.39, assuming that the $15,000 was intended for the revenue there is still a deficit of $3,796.39, making the total revenue $139,688.01.

COMPARATIVE STATEMENT OF REVENUE.

Amount collected during the year		$124,688 01
City appropriation		15,000 00
Amount outstanding Fixture rates	$1,265 10	
Amount outstanding Meter rates	160 69	
Amount outstanding Meter rates, not due	6,114 10	
		$7,539 89
		$147,227 90
Deduct amount due January 1, 1889		5,632 74
Revenue for 1889		$141,865 53
Revenue for 1888		134,480 27
Increase		$7,385 26

STATEMENT OF NET EARNINGS FOR 1889.

Revenue		$141,865 53
EXPENSES.		
Interest	$72,608 50	
Maintenance	22,284 54	
Rebate to Saugus	854 30	
		$95,747 34
Net earnings		$46,118 19

EXPENDITURES.

MAINTENANCE.

Pumping expenses	$7,669 25	
Salaries and office expenses	5,391 61	
Repairs on Mains	2,777 10	
Repairs on Services	2,502 84	
Stable and Workshop	1,432 39	
Damages	1,035 60	
New Supply	557 19	
Meters	473 29	
Engines and Boilers	445 27	
		$22,284 54

CONSTRUCTION.

New Basin	$150,812 35	
Mains, hydrants and gates	17,959 66	
Services and court mains	12,093 36	
New Supply	3,391 95	
Meters	1,760 54	
Tubular wells	475 00	
Birch Pond	375 00	
Pumping Engine	105 00	
		$186,972 86
Less amount received for pipe, etc.	$6,371 20	
Less amount received for wood	523 00	
		6,894 20
Net cost		$180,078 66

STATEMENT.

SHOWING COST OF WORKS TO JANUARY 1, 1890.

Mains, hydrants and gates		$634,194 82
Services and court mains		210,597 80
New supply and land		190,907 23
New basin and land		173,011 21
Reservoir and land		131,581 49
Birch pond and land		87,408 84
Engines and boilers		72,303 00
Engine-house and land		56,674 05
Breed's pond and land		52,790 10
Pipe, conduct and right of way		45,293 98
Force main and land		24,614 00
Highland service		12,350 67
Meters		21,565 52
Engineering		8,564 99
Tubular wells		8,845 35
Work-shop and stable		1,957 12
Total cost		$1,732,660 17
Less amount received for extra pipe, etc..	$72,180 13	
Less amount received for wood	1,197 50	
		73,377 63
Net cost		$1,659,282 54

Following will be found the usual tables, exhibiting the number of buildings, families, stores, factories, etc., supplied with water, the class of premises to which meters are attached, the number and kinds of fixtures, the yearly revenues of the department, etc., etc.

Respectfully submitted,

WALLACE O. MUDGE,

Water Registrar.

SERVICES.

Whole number of services January 1, 1889	8,325
Put in during the year	557
Total number January 1, 1890	8,882
New services let on during the year	452
Services shut off during the year for non-payment	11
Services let on by payment of rates and fines	7
Services let on for change of ownership or occupancy	17
Services shut off by request, or for vacancy	107
Services let on, premises re-occupied	122
Services discontinued	10
Services put in at Saugus during the year	49
Making the whole number in Saugus, January 1. 1890	248

The ratio of yearly increase in the number of services from 1876 is as follows:

1876	6.54 per cent.	1883	10.80 per cent.
1877	7.60 " "	1884	8.62 " "
1878	6.14 " "	1885	6.36 " "
1879	6.04 " "	1886	6.58 " "
1880	8.75 " "	1887	5.84 " "
1881	10.25 " "	1888	6.67 " "
1882	9.92 " "	1889	6.67 " "

STATEMENT

SHOWING THE NUMBER OF BUILDINGS TO WHICH WATER IS SUPPLIED, ALSO THE NUMBER OF FAMILIES, VARIOUS FIXTURES, ETC., CONTAINED IN THE SAME, TOGETHER WITH THE NUMBER OF FIRE HYDRANTS. DECEMBER 31, 1889.

	LYNN,	SAUGUS	TOTAL.
Dwellings	7,942	224	8,166
Stores	738	10	748
Factories	200	—	200
Offices	244	10	254
Restaurants and saloons	78	—	78
School-houses	35	2	37
Churches	25	—	25
Bakeries	30	—	30
Laundries	12	—	12
Engine-houses	5	—	5
Families	11,828	267	12,095
Boarding-houses	190	—	190
Faucets	20,202	424	20,626
Water closets	5,257	64	5,321
Bath tubs	1,814	48	1,862
Hand hose	2,663	88	2,751
Urinals	254	1	255
Heaters	234	4	238
Stationary engines	140	1	141
Motors	14	—	14
Greenhouses	26	4	30
Drinking fountains	24	—	24
Standpipes, fire	15	—	15
Standpipes for water carts	35	—	35
Sewer connections	15	—	15
Automatic sprinklers	15	—	15
Hydrants	621	83	704

STATEMENT

SHOWING THE CLASS OF PREMISES TO WHICH METERS ARE ATTACHED.

CLASS.	SIZES.									
	½	⅝	¾	1	1¼	1½	2	3	4	Total
Theatre	–	–	1	–	·	–	–	–	–	1
Board of Health	–	–	–	–	–	–	1	–	–	1
Bathroom	–	1	–	–	–	–	–	–	–	1
Brewery	–	–	–	–	–	1	–	–	–	1
Brickyard	–	–	–	2	–	–	–	–	–	2
Churches	–	1	–	1	–	–	–	–	–	2
City stable	–	–	–	1	–	–	–	–	–	1
Dwellings	1	16	25	4	–	–	–	–	–	46
Elevators	–	–	–	–	–	–	3	–	–	3
Engines	–	–	7	12	–	3	1	–	–	23
Factories	3	20	58	67	–	4	3	–	3	158
Fire engine-houses	–	–	1	1	–	–	–	–	–	2
Foundries	–	–	1	1	–	–	1	–	–	3
Gas works	–	–	–	–	–	2	1	–	-	3
Halls	–	–	1	3	–	–	–	–	–	4
Hotels	–	2	4	1	–	1	–	–	–	8
Laundries	–	3	4	3	–	–	–	–	–	10
Livery stables	–	5	3	2	–	–	–	–	–	10
Medical Laboratory	–	–	–	1	–	–	–	–	–	1
Oil works	–	–	–	1	–	–	–	–	–	1
Printing offices	–	1	–	1	–	–	–	–	–	2
Railroads	–	2	6	2	–	1	1	1	1	14
Saloons	–	–	1	1	–	–	–	–	–	2
Tugs and vessels	–	–	–	–	–	–	1	–	–	1
Motors	–	–	–	–	–	–	–	–	–	–
Stores and offices	2	6	6	3	–	1	-	–	–	18
Totals	6	57	118	107	–	13	12	1	4	318

STATEMENT

SHOWING THE YEARLY REVENUE OF THE DEPARTMENT SINCE THE FIRST INTRODUCTION OF WATER INTO THE CITY IN 1871.

From October 1, 1871, to January 1, 1872	$8,989 00
From January 1, 1872, to January 1, 1873	27,568 16
From January 1, 1873, to January 1, 1874	47,992 61
From January 1, 1874, to January 1, 1875	53,545 61
From January 1, 1875, to January 1, 1876	52,553 26
From January 1, 1876, to January 1, 1877	60,867 12
From January 1, 1877, to January 1, 1878	64,002 50
From January 1, 1878. to January 1, 1879	67,570 14
From January 1, 1879, to January 1. 1880	73,949 80
From January 1, 1880, to, January 1, 1881	79,635 12
From January 1, 1881, to January 1, 1882	80.967 76
From January 1, 1882, to January 1, 1883	94,419 52
From January 1, 1883, to January 1, 1884	98,893 54
From January 1, 1884, to January 1, 1885	114,903 86
From January 1, 1885, to January 1, 1886	110,089 11
From January 1, 1886. to January 1, 1887	116.375 70
From January 1, 1887, to January 1, 1888	123,507 73
From January 1, 1888, to January 1, 1889	134,480 27
From January 1, 1889, to January 1. 1890	141,865 53
	$1,552,176 34

REPORT OF THE SUPERINTENDENT.

David Knox, Esq., President of the Public Water Board:

In compliance with the City ordiance, I herewith present the annual report of the Superintendent, for the year ending Dec. 31, 1889.

WATER SUPPLY.

The additional storage basins constructed by Mr. George H. Bishop during the year, consist of two ponds formed by dams, one across Penny Brook in North Saugus, the other across Blood Swamp Brook. All work was done by the day, under his personal supervision, and in the most careful manner, nothing being omitted which was considered necessary to the strength and durability of the structures. Walden Pond dam is constructed across Penny Brook; the soil, stumps and mud were removed from the entire foundation, requiring for several hundred feet, a depth of from fourteen to eighteen feet, through the centre of the embankment; two lines of four-inch tongued and grooved sheet piling were driven four feet apart, the earth excavated to the bottom and the trench refilled with puddle, requiring 5,500 cubic yards.

The length of dam on crest, including wing, is (1,275) twelve hundred and seventy-five feet, with a spillway eighty feet in length.

The width of crest is (16) sixteen feet.

Slope of wet face (2 1-2) two and one-half to (1) one, and paved (15) fifteen inches in thickness, requiring 6,500 yards of paving.

Slope of dry face (2) two feet to one (1) of earth embankment, with (2) two feet of soil on top. A natural spillway, with masonry wall through centre and wing walls at ends, and paved slopes, containing (900) nine hundred square yards of paving.

The pond when full is (17) seventeen feet in depth; is provided with one discharge and one waste pipe, each thirty-six inches in diameter.

Glen Lewis dam across Blood Swamp Brook is (330) three hundred and thirty feet in length at crest and (40) forty feet in width, with a spillway (25) twenty-five feet in length, excavated through ledge and lined with masonry.

Inside slope of earth (3 1-2) three and one-half to (1) one, then covered with riprap.

Outside slope masonry wall with batter (1) one inch to (5) five feet, plum on back, and one discharge pipe (36) thirty-six inches in diameter.

This dam is situated in Walden Pond to give increased depth to the upper end; when full is (17) seventeen feet in depth.

To reach the upper dam and furnish a right of way to land owners, a road was built from Walnut street, crossing the pond on the upper dam, a distance of (2.78) two and seventy-eight one hundredths miles.

The total storage added by these basins amounts to 523,759,598 gallons, which increases our entire storage to 1,157,760,398.

PONDS.

At the commencement of the year Breed's Pond was full, with a slight overflow at Birch Pond. Wishing to draw all of our supply possible from the ponds, no water was taken from the brooks until March 25. On June 19th its use was stopped, and commenced again on October 29, continuing its use up to December 14. At this time, when so much attention is directed to the purity of the water used for domestic supply, and so many cities are suffering from the poor quality of water furnished, I wish to particularly call to your notice the tables containing the analysis of water made by the State Board of Health, which show as good results as may be desired. Not only have we at present a pure supply, but, by the action of the City Government in securing the Public Park, which forms a large portion of our watershed, together with the purchase, by the Water Board, of the land in Saugus, bordering on Birch, Walden and Glen Lewis's Ponds, all probable chance of contamination is removed.

Considering the possibilities for an increased consumption in the future equal to that made in the past, we can feel assured that our present supply, properly stored and handled, will prove sufficient for many years.

WATER FOR FIRE PURPOSES.

To what extent cities should supply water for fire purposes is not as yet fully understood as recognized authorities differ as to the proportion necessary between a domestic supply and the limit for fire supply.

The fire sprinkler is yet in its infancy. Should its introduction become general, upon narrow streets lined with brick blocks, no city can supply sufficient water in a large conflagration. The effective work of a sprinkler is at the commencement, in the first few moments before the fire is discovered and the firemen arrive, after that its efficiency is doubtful, and in many cases injurious. Supplying sprinklers with a chemical compound from tanks on roofs of buildings may prove of much greater efficiency than water from our street mains, and with less liability of damage to property where the fire is quickly subdued.

During the fire of November 26th, the amount of water furnished from 12 M. till 6 P.M., was 2,908,477 gallons; from 6 P.M. on the 26th to 6 A.M. on the 27th, 5,373,282 gallons; from 6 A.M. to 12 M., 2,827,736, making a total consumption in 24 hours of 11,109,495 gallons, equal to more than four times the average daily consumption for domestic purposes; a much greater quantity could have been delivered. The burning ruins required a further use of 19,376,984 gallons from hydrant streams.

No reason exists for furnishing water free for fire purposes to private parties, thus enabling them to secure lower rates of insurance than their immediate neighbors not so favored, though obliged to pay their proportionate share for furnishing this supply. A suitable rate should be established.

PUMPING STATIONS.

The buildings are in good condition. The engines and boilers are in first-class order. The Leavitt engine has now been in use for (17) seventeen years. On April 24th one side of the lower intermediate steam chest gave way. Examination showed it to be (1-2) one-half inch in thickness, instead of (7-8) seven eigths as required by the drawings. The defect was caused by the core floating while the casting was being made. A new side was made and secured by brackets, which were fastened to the solid metal of the bed-plate, no permanent injury has resulted from the break, as under the careful management of Mr. W. H. Messinger, the Chief Engineer, we have been able to produce a duty highly satisfactory.

The Deane pumping engine was used to supply the city until the necessary repairs were being made, which required eleven days.

Although the Deane pumping engine is in perfect condition, the increased consumption of water has made it imperative to furnish additional pumping capacity. A contract has been made with Arthur J. Loretz, of Brooklyn, for a Loretz high duty duplex compound rotative beam pumping engine, having a guaranteed daily capacity of 10,000,000 gallons in 24 hours, and developing a duty of not less than 108,000,000 foot pounds, to be erected and ready for operation on or before the 1st day of July, 1890. By removing the Deane pumping engine sufficient space remains for its reception. When completed we shall have a daily pumping capacity of 15,000,000 gallons, so arranged that in case of an accident to either engine, we will still have a daily pumping capacity of 10,000,000 gallons, which is in excess of our present source of supply. The boilers have been in use (17) seventeen years, and we must soon put in a new pair, of greater capacity, to be prepared for the greater consumption and also prevent pelay while repairs are being made.

On August 5th the check valve under the sidewalk was examined and adjusted; it was found to be wearing considerably, and will soon need to be replaced by a new one.

August 12th, examined and adjusted the 20-inch gate, near the Reservoir.

October 28th, put in new hub shaking grates, and find a considerable saving in coal.

December 7th, put in a new Worthington duplex feed pump to supply the boilers and replace the Blake pump, which has been in use from the time the works first started, and find a saving in steam, consequently a saving in coal by this change.

I would recommend that the old Worthington duplex pump that was first used to supply the city with water (20) twenty years ago, be sold. It has not been in operation for (14) fourteen years. Also the Deane pumping engine and Knowles pump of 1,000,000 daily capacity, situated at the tubular wells.

As soon in the spring as work can be carried on to the best advantage, a 30-inch force main from the Pumping station to the reservoir should be laid.

CANAL.

The canal needed no repairs, except a renewal of the fence enclosing it for a short distance and the removal of the vegetable matter from the sides and bottom, which were thoroughly cleaned. Before using the canal and tunnel were freely flushed, to render the water as pure as possible.

RESERVOIR.

The reservoir has received all needed care and attention; the water has been kept at an average depth of (15) fifteen feet (6) six inches from August 1st till August 5th. No pumping was done to lower the water in the reservoir sufficiently for an examination of the slope walls, which were found in good condition.

STREET MAINS.

The great number of bursts during the year, together with the general condition of the pipes taken out from Market and Broad streets shows the imperative need of taking up our cement-lined pipes and replacing them with cast iron.

Fortunately this year there has been no damage of any account caused by these frequent bursts, still the expense of repairs adds largely to the cost of maintenance, and aside from the direct expense entailed for the labor and material on the leak itself, the loss experienced in the regular work the men are engaged upon when the burst occurs is a large item. Upon many of our streets the cost of repairs has been in excess of the interest on the expense of laying larger cast iron pipes. Thus leaving out of account the annoyance caused to the citizens by the deprivation of water and the liability of large damage at any moment. The time has arrived when these streets should be supplied with larger cast iron mains.

During the year, the cement-lined pipes on Park square, Market and Broad streets to Union, were taken up and replaced with larger ones of cast iron; (72) seventy-two services were changed from the old pipe to the new; 19,238 feet 10 inches of cast iron pipe, from 4 inches to 16 inches in diameter has been laid in (42) forty-two streets, and (5,714) of a smaller size have been laid in (19) nineteen courts as mains. Twenty-four gates have been set in connection with the new mains, and (15) fifteen on court pipes. Nineteen hydrants have been set on the pipe laid this year. Five hundred and eight services have been put in, aggregating 22,817 feet.

Twenty-nine services have been extended, of an aggregate length of 1,262 feet, seven inches, and (135) services have been discontinued.

In trenching for mains 1,082 feet in length of ledge has been excavated. Forty-nine services have been laid in Saugus, of an aggregate length of 2,787 feet eight inches. Six new hydrants have been set in place of old ones. Twenty-five hydrants have been repaired. Twelve new gate boxes to replace old ones; (8) eight gates repaired. Five hundred and twenty-nine feet of main pipe have been lowered on account of bringing Eastern avenue to grade: (11) eleven services have been lowered on this account. Nine other services have been lowered. Three hundred and fifty-four corporations have been dug up and drilled out; (358) three hundred and fifty-eight new iron stop boxes put in place of decayed wooden ones; (55) fifty-five new meters put in; (54) fifty-four meters changed and repaired; (67) sixty-seven meters taken off and returned to the shop after the fire; (32) thirty-two corporations put on in place of old ones; (18) eighteen new outside meter boxes put in; (23) twenty-three stop and wastes put in to replace old ones; (82) eighty-two leaks on services were repaired; 1,329 feet, 5 inches of pipe was laid in Pine Grove cemetry.

The following tables show the work performed by the department for the year.

Respectfully submitted,

JOHN C. HASKELL, *Supt.*

1889.—ANALYSIS OF WATER BY THE STATE BOARD OF HEALTH.

PARTS 100,000.—BREED'S POND.

DATE OF EXAMINATION.	APPEARANCE.		ODOR.		RESIDUE ON EVAPORATION.				AMMONIA.		Chlorine.	Nitrogen as Nitrates.	Nitrogen as Nitrites.	Hardness.
	Turbidity.	Color.	Cold.	Hot.	Total.	Loss on Ignition.	Fixed.	Odor on Ignition.	Free.	Albuminoid.				
Jan. 16	Slight—very slight sediment.	0.6	Faintly grassy.	None.	3.20	1.05	2.15	Peaty.	.0000	.0196 .0156	.43	.0070	.0004	
Feb. 21	None—very slight sediment.	0.35	None.	None.	3.15	1.15	2.00	Peaty.	.0024	.0146 .0130	.44	.0050	.0003	
Mar. 21	Very slight—slight sediment.	0.3	Faintly grassy and vegetable.	Distinctly vegetable.	3.05	1.05	2.00	Peaty.	.0002	.0166 .0118	.40	.0030	.0001	
Apr. 18	Decided—slight sediment.	0.5	None.	Distinctly mouldy.	2.95	0.90	2.05	Peaty.	.0002	.0190 .0138	.38	.0020	.0001	
May 17	Slight—considerable white sediment.	0.4	Faintly vegetable.	Faintly grassy.	3.10	0.95	2.15	Peaty.	.0002	.0200 .0168	.40	.0030	.0000	
June 14	Slight—slight green sediment.	0.25							.0002	.0232 .0168		.0020	.0001	
July 18	Slight—very slight sediment.	0.5							.0024	.0228 .0198		.0020	0001	
Aug. 17	Slight—slight sediment.	0.5							.0008	.0232 .0192		.0030	.0001	
Sept. 19	Slight—slight sediment.	0.65							.0006	.0220 .0194		.0030	.0000	
Oct. 16	Slight—considerable light green sediment.	0.3							.0004	.0272 .0194		.0020	.0000	
Nov. 19	Very slight—slight sediment.	0.7							.0000	.0194 .0150		.0050	.0001	
Dec. 12	Very slight—very slight sediment.	0.4							.0012	.0216 .0180		.0050	.0000	
Averages		0.45			3.09	1.02	2.07		.0007	.0157	.41	.0035	.0001	

1889—ANALYSIS OF WATER BY THE STATE BOARD OF HEALTH.—(*Continued.*)

PARTS IN 100,000 BIRCH POND.

DATE OF EXAMINATION.	APPEARANCE.		ODOR.		RESIDUE ON EVAPORATION.				AMMONIA.		Chlorine.	Nitrogen as Nitrates.	Nitrogen as Nitrites.	Hardness.
	Turbidity.	Color.	Cold.	Hot.	Total.	Loss on Ignition.	Fixed.	Odor on Ignition.	Free.	Albuminoid.				
Jan. 16	Slight—very slight sedimer t.	0.3							.0000	.0182	.42	.0100	.0003	
Feb. 21	Very slight—slight green sediment.	0.1	None.	Distinctly grassy.	2.95	1.05	1.90	Peaty.	.0008	0162 .0156	.45	.0050	.0002	
Mar. 21	Slight—slight sediment.	0.15	Very faint or none.	Distinctly vegetable.	3.20	1.30	1.90	Earthy.	.0000	.0238 .0164	.41	.0050	.0002	
Apr. 18	Decided—very slight sediment.	0.1	None.	Distinctly mouldy.	2.85	1.25	1.60	Peaty.	0004	.0230 .0150	.39	.0030	.0001	
May 17	Slight—considerable greenish sediment.	0.1	Faintly vegetable and unpleasant.	Faintly vegetable and unpleasant.	2.85	0.95	1.90	Peaty.	.0012	.0254 .0200	.39	.0030	.0001	
June 14	Slight—slight green sediment.	0.2							.0022	.0234 .0204		.0020	.0000	
July 18	Nearly distinct—slight sediment.	0.2							.0026	.0278 0230		.0020	.0001	
Aug. 17	Distinct—considerable green-brown sedim'nt	0.2							.0034	.0264 0224		.0040	.0000	
Sept. 17	Distinct—slight sediment.	0.35							.0034	.0284 .0204		.0000	.0001	
Oct. 16	Slight—slight brown sediment.	0.4							.0000	.0220 .0182		.0020	.0000	
Nov. 19	Very slight—slight sediment	0.35							.0004	.0244 .0174		.0070	.0002	
Dec. 12	Very slight—very slight sediment.	0.25							.0024	.0248 .0206		.0150	.0001	
Averages		0.23			2.96	0.95	1.82		.0014	.0205	.41	.0048	.0001	

1889.—ANALYSIS OF WATER BY THE STATE BOARD OF HEALTH.—(*Continued.*)

PARTS IN 100,000.—CANAL.

DATE OF EXAMINATION.	APPEARANCE.		ODOR.		RESIDUE ON EVAPORATION.				AMMONIA.		Chlorine.	Nitrogen as nitrates.	Nitrogen as nitrites.	Hardness.
	Turbidity.	Color.	Cold.	Hot.	Total.	Loss on Ignition.	Fixed.	Odor on Ignition.	Free.	Albuminoid.				
Apr. 18	Slight—very slight sediment.	0.9	Very faint or none	Faintly vegetable and sweetish.	3.55	1.40	2.15	Peaty and slig't-ly disag'able.	.0006	.0198 .0176	.36	.0060	.0001	
Nov. 22	Very slight—very slight sediment.	1.3			5.20	2.70	2.50		.0000	.0228 .0220	.34	.0020	.0003	

SUMMARY OF STATISTICS.

REPORT OF 1889.

IN ACCORDANCE WITH SUGGESTIONS ADOPTED BY THE NEW ENGLAND WATER WORKS ASSOCIATION.

LYNN WATER WORKS, LYNN, MASS.

Population by census of 1885	45,861
Date of construction	1870 to 1872

Owned by the City of Lynn.

Source of supply:—Four artificial storage basins, formed by damming four brooks, and the water of one other brook in North Saugus taken direct.

Mode of supply:—By gravitation to the pump well, and pumped thence to distributing reservoir at an elevation of 177 feet above mean high tide, by one Leavitt engine, built by I. P. Morris & Co., of Philadelphia, of 5,000,000 gallons daily capacity, and one Deane engine, built by the Deane Steam Pump Co., of Holyoke, Mass., of 3,000,000 gallons daily capacity.

Kind of coal used, George's Creek, Cumberland.

Four dollars and ninety-five cents per net ton delivered, 2,000 lbs.

Coal consumed for the year in pounds, for all purposes .	1,295,522
Total pumping in gallons	895,966,403
Average head, including friction in feet	170.20
Number of gallons pumped per pound of coal . . .	691.59
Duty on total coal consumed, no deductions . , .	106,628,900
Cost of pumping (figured on pumping station expenses, viz: $8,269 97) per million gallons into the reservoir	$8.65
Per million gallons one foot high	$0.050

FINANCIAL.

Receipts —	For water for all purposes	$138,848 94
	Summons, shutting off and letting on	213 30
	Rent and sundries	625 77
	Total revenue	$139,688 01
	Labor and material	6,371 20
	Sale of wood	523 00
	Total receipts	$146,582 21

Expenditures —	Management and repairs	$21,248 94
	Interest on bonds	73,462 80
	Damages	1,035 60
	Total	$95,747 34
	Carried to credit of construction	6,894 20
	Carried to sinking fund	43,940 67
		$146,582 21

CONSUMPTION.

Estimated population to date, Lynn and Saugus	58,882
Estimated population supplied	56,099
Total number of gallons consumed for the year	894,401,026
Total number of gallons metered	121,930,400
Average daily consumption in gallons	2,450,413
Gallons per day to each consumer	43.68

DISTRIBUTION.

Kind of pipe used, wrought-iron, cement-lined, and cast-iron.

Size, from 4 to 16 inches diameter.

Extended	4 m. 1,757 ft.
Total now in use	87 m. 1,368 ft.
Number of leaks for the year	106
Hydrants added	19
Hydrants now in use	620
Gates added	39
Gates now in use	752
Range of pressure at center of city for day and night	54 to 65 lbs.

SERVICES.

Kind of pipe used, iron, cement-lined, adamanta and galvanized iron.

Size of pipe used, 3-4 inch to 6 inch diameter.

Extended	24,079 ft. 7 in
Total now in use	66 m. 4,816 ft.
Number of services added	508
Number of services discontinued	135
Number of services now in use	8,606
Meters added	70
Meters now in use	324

TABLE I.

RECORD OF THE LEAVITT ENGINE FOR THE YEAR ENDING DECEMBER 31, 1889.

DATE.	No. of pumping days.	Total pumping time per month	Average pumping time per day.	Number of revolutions per month.	Average revolutions per minute.	COAL CONSUMED.				Ashes.	Ashes.	Gallons pumped per mon., allowing 4 per cent. for loss of action in the pump.	Average No. gals pumped per lb. of coal excluding heating when not pumping.	Average number of gallons raised 100 feet high per pound of coal.	Average head against the pump.	Average duty in lbs. of water raised one foot high per 100 lbs. of coal, no deduction for ashes.	Average duty in lbs. of water raised 1 foot high per 100 pounds of coal. ashes deducted.	Oil.	Waste.	Depth of water in well.
						Starting fires.	Pumping and heating.	Banking.	Total.											
Month.	Days	H.M.	H. M.	Rev.	Rev.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Pr ct.	Galls.	Galls.	Galls.	Feet.	Pounds.	Pounds.	Gal.	Lbs.	Feet
Jan.	27	347.30	12.52	370,400	17.76	7,400	87,700	4,600	99.700	9,520	9.55	69,098,120	693.	1176.57	169.78	103,562,426	114,495,642	9	12	5 50
Feb.	24	316.	13 10	342,300	18.05	6,400	81,100	4,200	91,700	8 800	9 59	63,856,065	696.3	1188.44	170.68	104,599,960	115,703,454	8	13	5.50
Mch.	26	331.55	12.46	357,600	17.9	7.000	85,000	4,400	96,400	8,870	9.20	66,710,280	692.	1181.24	170 70	103,961,471	114,496,572	8	12	5.50
Apr	19	258.5	13.31	277,671	17.87	4,700	65,700	2,800	73,200	6,420	8.77	51,799,525	707.6	1207.23	170.61	106,252,557	116,407,313	6	8	5.50
May	22	306.55	13.57	337,629	18.33	5,500	83,400	3,400	92,300	10,040	10 87	62,984,690	682.3	1163.79	170.57	102,433,484	114.935,698	6	7	5.50
June	25	350.5	14.16	390,900	18 25	6,100	95,300	4.000	105,400	10,470	9 93	72,922,395	691.8	1180 00	170.57	103,855,181	115,309,766	8	9	5 50
July	26	397.40	15.17	438,100	18.30	6,000	107,150	3,600	116,750	10,770	9.22	81,727.555	700.	1190 56	170.08	104,785,196	115,433,776	10 5	7.5	5 50
Aug.	25	384.10	15.22	421,600	18 42	4,900	101,350	3,000	109,250	11.865	10.86	79,209,130	725.	1232.57	170.01	108,484,451	121.707,640	9	12	5.50
Sept.	25	371.	14 50	410,600	18.44	6,500	94.950	3,800	105,250	11,550	10 97	76 597,430	727.7	1238.54	170.20	109,011,238	122,448 590	10	12	5.50
Oct.	27	366.15	13.33	405,700	18.47	6,700	93,150	4,400	104,250	10,230	9.81	75,083,335	725.9	1239.47	170 75	109,092,988	120 973,029	12	12	5.50
Nov.	26	400.30	15.24	445,606	18.54	5,800	99,950	3,400	109,150	11,000	10.08	83,127,800	761.6	1294.72	170.13	114,077 954	126,853 053	14.5	12	5.50
Dec.	25	404.35	16.11	447,194	18.42	5,300	100,650	3,200	109,150	12,020	11 01	83,424,038	764.3	1292.35	169.09	114,285,202	128,428,187	14	12	5 50
Tot'ls and av'g's	297	4,242.15	14.17	4,648,300	18.24	72,300	1,095,400	44.800	1,212,500	121,555	10.02	867,140,363	715.1	1217.10	170.20	107,124,013	119,059,958	115.	128.5	5.50

TABLE I.—*(Continued.)*

COST OF PUMPING FOR THE YEAR 1888.

1,212,500 pounds of coal, at $4.95 per net ton (2,000 lbs.)	$30,000 94
Repairs on engine and boilers	445 27
Oil, packing, waste, etc.	355 14
Sundry small stores	61 04
Insurance	41 66
Wages of Engineers and Firemen	3,641 94
	$7,545, 99

Cost of raising one million gallons into the reservoir	$8 70 00
Cost of raising one million gallons one foot high	0 05 11

TABLE II.

RECORD OF THE DEANE PUMPING ENGINE FOR THE YEAR ENDING DECEMBER 31, 1889.

DATE.	No. of pumping days.	Total pumping time per month.	Average pumping time per day.	Number of revolutions per month.	Average revolutions per minute.	COAL CONSUMED.					Ashes.	Gallons pumped per month allowing 4 per cent. for loss of action in the pump.	Average number of gallons pumped per pound of coal.	Average number of gallons raised 100 feet high per pound of coal.	Average head against the pump.	Average duty in pounds of water raised one foot high per 100 pounds of coal, no deductions for ashes.	Average duty in pounds of pater raised one foot high per 100 pounds of coal, the ashes deducted.	Oil.	Waste.
						Starting fires.	Pumping and heating.	Banking.	Total.	Ashes.									
Month.	Days	H. M.	H. M.	Rev.	Rev.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Pr ct.	Galls.	Galls.	Galls.	Feet.	Pounds.	Pounds.	Gal.	Lbs.
January	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
February	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
March	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
April	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
May	6	128.	21.20	167,000	21.74	1200	38,072	600	39,872	3,323	8 33	15,698,000	393.7	593.86	151.11	51,948.587	56,275,904	2	3
June	5	107.10	21.26	139,660	21.75	300	31,650	300	32,250	3,500	10.85	13,128,040	407.	612.20	150.41	53,465,508	59 265,515	2	3
July	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
August	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
September	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
October	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
November	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
December	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Totals and Averages	11	235.10	21.23	306,660	21.74	1500	69,722	900	72,122	6,823	9.47	28 826,040	399.60	602 92	150.88	52,657,191	57,643,827	4	6

TABLE III.

CONSUMPTION OF WATER FOR THE YEAR.

	Monthly Consumption.	Average Consumption per day.	Average daily increase.	Average daily decrease.	Average to each consumer.	Average to each inhabitant.
Month.	Gallons.	Gallons.	Gallons.	Gallons.	Galls.	Galls.
January .	68,584,783	2,212,412		22,001	39.4	37.6
February .	64,443,744	2,301,562	89,150		41.2	39.1
March . .	67,870,720	2,189,378		112,184	39.0	37.2
April . .	66,981,993	2,232,733	43,355		39.8	38.0
May . . .	74,407,395	2,400,238	167,505		42.8	40.8
June . . .	75,969,612	2,532,320	132,082		45.1	43.0
July . . .	78,614,936	2,535,966	3,646		45.2	43.1
August . .	79,431,411	2,562,303	26,337		45.7	43.5
September	76,532,973	2,551,099		11,204	45.5	43.4
October .	75,527,276	2,436,364		114,735	43.4	41.4
November .	87,284,985	2,909,499	473,135		51.8	49.5
December .	78,751,198	2,540,361		369,138	45.3	43.2
	894,401,026	2,450,413			43.68	41.66

TABLE IV.

SHOWING THE AMOUNT OF RAINFALL ON THE WATERSHED OF BREED'S POND, EXCLUSIVE OF THE WATER SURFACE, AMOUNT OF WATER DRAWN FROM THE POND, AMOUNT WASTED, AND PERCENTAGE OF RAINFALL AVAILABLE FOR USE IN 1889.

Year.	Rainfall.	Amount of rainfall on the watershed of Breed's pond.	Amount of water drawn from Breed's pond for consumption.	Amount of water wasted from Breed's pond.	STORAGE.		Total amount of rainfall available for use.	Daily average.	Percentage of rainfall available for use.	Amount drawn from the brooks.
					Increase.	Decrease.				
	Inches.	Gallons.	Gallons.	Gallons.	Gallons.	Gallons.	Gallons.	Gallons.	Per cent.	Gallons.
1889	56.65	815,778,694.	436,220,952	——	——	20,343,954	415,876,998	1,139,389	50.98	280,638,796

TABLE IV.—*(Continued.)*

SHOWING THE AMOUNT OF RAINFALL ON THE WATERSHED OF BIRCH POND EXCLUSIVE OF THE WATER SURFACE AMOUNT OF WATER DRAWN FROM THE POND, AMOUNT WASTED, AND PERCENTAGE OF RAINFALL AVAILABLE FOR USE IN 1889.

Year.	Rainfall.	Amount of rainfall on the watershed of Birch pond.	Amount of water drawn from Birch pond for consumption.	Amount of water wasted from Birch pond.	STORAGE.		Total amount of rainfall available for use.	Daily average.	Percentage of rain-fall available for use.	Amount drawn from the brooks.
					Increase.	Decrease.				
	Inches.	Gallons.	Gallons.	Gallons.	Gallons.	Gallons.	Gallons.	Gallons.	Per cent.	Gallons.
1889	56.65	651,575,534	179,106,655	21,282,100		6,652,109	193,736,646	530,785	29.73	

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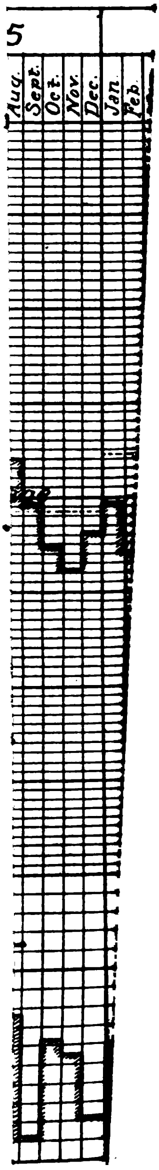

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TABLE IV.—*(Continued.)*

TABLE V

SHOWING THE DEPTH OF WATER IN THE PONDS FOR EACH WEEK DURING 1889.

Date.	Breed's.		Birch.		Date	Breed's.		Birch.		Date.	Breed's.		Birch.	
	Feet.	In.	Feet.	In.		Feet.	In.	Feet.	In.		Feet.	In.	Feet.	In.
Jan. 1	20	2½	21	½	May 14	20	11½	21	7	Sept. 21	18	10	18	2½
" 8	20	3½	21	10¾	" 21	21	—	21	9	" 28	18	—	18	½
" 15	19	11¾	22	1½	" 28	21	½	21	11½	Oct. 5	17	2	17	11
" 22	19	11½	22	1¼	June 3	21	2	22	1½	" 12	16	4	17	11½
" 29	19	10½	22	2½	" 10	21	1	22	1	" 19	15	9½	18	½
Feb. 7	19	5½	22	1	" 17	21	1½	22	½	" 26	15	—	18	½
" 14	19	4	21	9	" 24	20	7	21	10	" 31	15	6½	18	4
" 21	19	11	21	4½	" 29	20	1½	21	9	Nov. 7	15	4	18	5
" 28	19	6½	21	½	July 3	19	8	21	9	" 14	15	9	18	6½
March 6	19	3½	21	4	" 10	18	11½	21	8	" 21	16	4½	18	11½
" 13	19	3½	21	6½	" 16	18	4	21	16½	" 27	17	1½	19	2
" 20	19	8½	21	3½	" 24	17	8½	21	5	Dec. 2	18	9½	19	11½
" 27	19	10½	20	11½	" 31	18	2½	21	1	" 9	19	5¾	20	2½
April 3	20	5½	21	2½	Aug. 7	19	5	21	1	" 16	19	8½	20	4½
" 10	20	7	21	4½	" 14	19	10	20	6	" 23	19	8½	20	7½
" 17	20	6	21	4½	" 21	20	2½	19	11½	" 30	19	6	20	9½
" 24	20	7	21	5½	" 28	20	3	19	2					
" 30	20	9½	21	7½	Sept. 7	20	3	18	—					
May 7	21	–	21	8	" 14	19	3½	17	10½					

TABLE VI.

SHOWING THE RAINFALL AT THE PUMPING STATION FOR 1889.

Day of the month.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1	....	....	....	0.94	....	1.20	0.02	1.32	....	0.06	....	...
2	....	....	....	....	....	0.50	0.23	....	....	..	0.02	0.01
3	....	....	....	....	0.09	0.59	0.67	0.17	....	....	0.48	0.07
4	....	....	0.23	....	....	0.02	0.28	....	....	....	....	0.01
5	0.45	0.60	0.67	....	....	0.47	....	0.10	....	....	....	0.10
6	3.17	....	....	....	....	....	....	....	...	0.60	....	....
7	0.12	....	0.83	....	....	....	....	....	....	0.04	....	....
8	....	0.09	....	....	....	0.31	....	....	....	....	....	0.64
9	0.35	0.01	....	....	....	....	....	0.60	....	....	0.20	0.03
10	....	....	....	....	....	0.17	....	0.02	0.01	....	0.17	0.20
11	....	0.57	....	0.04	0.01	0.05	0.05	....	0.41	....	0,08	....
12	....	0.08	....	0.17	....	....	....	....	....	1.45	....	....
13	....	....	....	....	0.04	....	....	1.43	0.58	0.05	0.57	....
14	....	....	....	....	0.01	....	0.11	1.06	0.11	0.25	....	0.43
15	....	....	....	....	....	0.10	0.56	....	0.15	....	....	....
16	0.13	0.42	0.47	....	....	0.33	....	....	....	....	....	....
17	0.33	....	0.15	0.58	....	0.07	0.23	....	0.75	....	....	0.01
18	....	0.55	0.01	0.02	....	....	....	....	0.79	....	....	0.73
19	....	....	....	....	0.33	....	0.60	....	....	....	1.52	....
20	0.92	....	....	0.10	2.06	....	0.88	....	0.15	....	0.10	....
21	....	....	....	0.01	0.79	....	....	....	0.10	0.15	0.48	...
22	....	....	....	....	....	....	....	....	....	0.03	....	0.21
23	....	....	....	....	0.04	....	0.98	0.22	....	....	....	....
24	....	0.01	....	....	0.17	....	....	0.11	....	0.01	....	0.43
25	....	....	....	....	0.20	....	....	....	0.02	....	....	....
26	....	....	....	1.60	0.11	0.01	0.03	....	0.08	....	....	0.02
27	0.93	0.03	0.03	0.10	0.63	....	1.92	....	....	1.75	2.03	....
28	0.03	....	0.15	....	....	0.92	0.44	....	....	0.25	1.00	....
29	....	....	0.03	....	....	....	0.01	....	....	0.18	....	0.08
30	....	....	....	....	....	....	1.15	....	0.28	....	....	....
31	....	....	0.62	....	0.03	....	0.59	....	....	....	....	....
	6.43	2.36	3.19	3.56	4.51	4.74	8.75	5.03	3.43	5.03	6.65	2.97

Rainfall for the year, 56.65 inches.

TABLE VII.

SHOWING THE AMOUNT AND SIZE OF PIPE LAID IN 1889.

STREETS WHERE LAID.			Kind of pipe	SIZE OF PIPE (in inches).				
Street.	From	To		16	12	10	6	4
Apple	Rockland	End of street		—	—	—	391	—
Averill	Lynnfield .	End of street	C. I.	—	—	—	—	320
Bell Ave. . . .	Ashland .	Laurel . . .	“	—	—	—	—	246
Broad	Market .	—	“	—	—	255	—	—
Broadway . . .	Extension	Peabody line	“	—	—	—	1,717	—
Broadway place	Broadway	End of place	“	—	—	—	393	358
Brookvale . . .	Boston . .	End of street	“	—	—	—	—	733
Burrill Ave. . .	Lewis . .	End of ave.	“	—	—	—	—	601
Carlton	Hawthorne	Grant . . .	“	—	—	—	228.6	—
Coburn	Webster .	—	“	—	—	—	209.6	—
Eastern Ave. .	Extension	—	“	—	—	293.9	*629	—
Ellsmere place .	Lewis . .	—	“	—	—	—	—	285.6
Factory . . .	John . .	—	“	—	—	—	—	270.6
Forest Garden av.	Lynnfield	—	“	—	—	—	—	549
Friend-st. ct. .	Friend . .	End of court	“	—	—	—	—	97.3
Fulton	Bay view av	End of street	“	—	—	—	354	—
Fuller	—	—	“	—	—	—	—	88
Halford place .	E Highland	End of street	“	—	—	—	—	205.6
Hancock . . .	Everett .	Winthrop . .	“	—	—	—	279	—
Harvest . . .	Extension	End of street	“	—	—	—	508.6	—
Holyoke . . .	Gardiner .	Extension .	“	—	—	—	1,057.6	—
Ingalls ave. . .	Extension	End of ave.	“	—	—	—	250	—
John	Extension	Factory . .	“	—	—	—	331.10	—
Light	Extension	End of street	“	—	—	—	—	1,173
Lillian ave. . .	Empire .	Eastern ave.	“	—	—	—	609	—
Lynnfield . . .	Extension	—	“	—	—	—	1,479.6	—
Madison . . .	Livingston	Extension .	“	—	—	—	—	164
Market	Essex . .	Broad . . .	“	12	1,097.6	542.6	—	—
Mt. Hood . . .	Essex . .	End of street	“	—	—	—	—	192
Northern ave. .	Extension	End of street	“	—	—	—	—	95
Oakland . . .	Boston .	End of street	“	—	—	—	—	534
Ontario	Tapley . .	connect'g ends	“	—	—	—	212	—
Pacific	Eastern av.	Extension .	“	—	—	—	—	445
Park place . .	Summer .	End of place	“	—	—	—	551	—
Park square . .	Essex . .	—	“	—	169	—	—	—
President . . .	Extension	—	“	—	—	—	170	—
Rockingham . .	Extension	Grant . . .	“	—	—	—	31	—
Rockland . . .	E Highland	Apple . . .	“	—	—	—	190	—
Webster . . .	Extension	Coburn . .	“	—	—	—	418.6	—
Whiting . . .	Summer .	—	“	—	—	—	—	119.6
Winthrop . . .	Hancock .	Winthrop ct.	“	—	—	—	131.6	—
Woodman .	Cottage .	Waterford .	“	—	—	—	251.6	—
Totals				12	1,266.6	1,091.3	10,392.10	6,476.3

*529 feet relaid.

TABLE VII.—*(Continued).*

AMOUNT AND SIZE OF PIPE LAID IN 1889.

STREETS WHERE LAID.			Kind of pipe.	SIZE OF PIPE.			
Street.	From.	To.		2 in.	1½ in.	1¼ in	¾ in
Anoka pl. .	Western av.	End pl. .	C. L.	243	–	–	–
Atkinson st.	Linwood .	–	Galv.	427.2	–	–	–
Atlanta ter.	Ocean . .	End ter. .	Ad'm'ta	528.9	–	–	–
			C. L.	221.3	–	–	–
Bell av. . .	Ashland .	–	"	202.3	–	–	–
Cook st. .	Holling'w'th	–	"	85	–	–	–
Echo pl. .	Boston . .	End pl. .	"	296.4	–	–	–
Fayette pl.	Fayette . .	Chestnut	"	322.11	–	–	–
Hemlock av.	In cemetery	–	Adamanta	540.9		Gal. 231.6	Gal 65.2
Jefferson pl.	Jefferson .	End pl. .	C. L.	112.2	–	–	–
Lakeside ct.	Extension .	End ct. .	Adamanta	296.3	–	–	–
Larch av. .	In cemetery	–	"	–	Gal. 361.6	–	–
Temple pl.	Summer .	End pl. .	C. L.	279.4	–	–	–
Ocean av. .	Atlantic ter.	–	"	197.2	–	–	–
Olive av. .	In cemetery	-	"	–	–	Gal. 130.6	–
Porter st. ct.	Porter . .	End ct. .	–	375.2	–	–	–
Tower pl. .	Boston . .	End pl. .	C. L.	260	Gal. 65	–	–
Winthrop ct.	Winthrop .	End ct. .	"	176.10	–	–	–
Washburn ct	Clinton . .	End st. .	"	155.4	–	–	–
Shill'ton ct.	Linwood .	End ct. .	"	140.8	–	–	–
Totals				4,860	426 6	362	65.2

	Miles.	Feet.
Total pipe laid in 1889, ...	4	3,882.0
" cast iron lowered, ...	—	529.0
" cement pipe taken up and replaced, . .	—	2,076 0
" extension, ...	4	1,227 0
" previously laid, ...	82	4,891.5
" laid to January 1st, 1890, ...	87	838.5
" laid in Saugus, ...	9	1,035.0
Private pipe in Swampscott, ...	—	1,778.0
Total supplied by the works.	96	3,651.5

TABLE VIII.

SHOWING THE NUMBER, SIZE AND LENGTH OF SERVICES LAID IN LYNN IN 1889.

MONTH.	6 inch.		4 inch.		2 inch.		1 1-2 inch		1 1-4 inch.		1 inch.		3-4 inch.		TOTAL.	
	No.	Feet.	No.	Feet.	No.	Feet.	No.	Feet	No.	Feet.	No.	Feet.	No.	Feet.	No.	Feet.
January	—	—	—	—	—	—	—	—	—	—	1	71.0	4	209.10	5	280.10
February	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
March	—	—	1	19.0	—	—	—	—	—	—	6	241.6	9	382.2	16	642.8
April	—	—	—	—	—	—	—	—	—	—	17	1,141.2	30	1,191.9	47	2,332.11
May	—	—	—	—	—	—	—	—	1	30.4	28	1,601.10	32	1,121.7	61	2.753.9
June	2	474.6	—	—	—	—	2	96.6	—	—	13	736.0	16	850.2	33	2,157.2
July	—	—	—	—	—	—	—	—	2	213.0	15	862.6	32	1,241.8	49	2.317.2
August	—	—	—	—	—	—	—	—	—	—	19	888.11	28	922.4	47	1,811.3
September	—	—	—	—	—	—	—	—	1	23.10	11	607.11	33	1,523.6	45	2,155.3
October	—	—	1	300.4	1	12.8	—	—	—	—	15	916.9	24	806.1	41	2.035.10
November	—	—	1	16.7	—	—	3	43.11	—	—	22	1,223.5	64	1,991.2	90	3,275.1
December	—	—	—	—	—	—	—	—	3	232.3	29	1.254.1	42	1,568.9	74	3,055.1
Totals	2	474.6	3	335.11	1	12.8	5	140.5	7	499.5	176	9,545.1	314	11,809.0	508	22,817.0

TABLE IX.

SHOWING THE LOCATION OF GATES SET IN 1889.

STREET.	LOCATION.	Size. Inches.
Anoka place. .	On S. line Western av., 8 ft. 10. in. W. of E. line Anoka place	2
Atlantic terrace .	On S. line Ocean st., 8 ft 6 in. W. of E. line Atlantic Terrace	2
Averill st. .	On W. line Lynnfield st., 15 ft N. of S. line Averill st.	4
Atkinson . .	On W. line Linwood st., 16 ft. 7 in. S. of N. line Atkinson st.	2
Bell ave. . .	On W. line Ashland st. 15 ft. 6 in. S. of N. line of Bell ave. . . . . , .	2
Bell ave. . .	On E. line Ashland st., 16 ft. 6 in. S. of N. line of Bell ave.	4
Broadway . .	3 ft. 6 in. N. hydrant, 9 5ft. in. E. of W. line of Broadway, ...	6
Brookvale . .	On S. line Boston st., 9 ft. W. of E. side of Brookvale st.	4
Burrill ave. .	On N. line Lewis st., 15 ft. E. of W. line of Burrill ave.	4
Cook . .	On S. line E. Hollingsworth st., 15 ft. 2 in E. of W. line of Cook st.	2
Echo place .	On S. line of Boston st., 11 ft. 6 in. E. of W. line of Echo place, ...	2
Ellsmere place .	On N. line Lewis st, 9 ft. 8 in. E. of W. line of Ellsmere place, ...	4
Fayette place .	On E. line Chestnut st., 9 ft. S. of N. line of Fayette place, ...	2
Fayette place .	23 ft. W. of W. line Fayette st., 30 ft. 10 in. S. of N. line of Fayette st. . .	2
Forest Garden av	On N. line Lynnfield, 22 ft. 6 in. N. of S. side Forest Garden ave.	4
Friend st. ct. .	On S. line Friend st., 16 ft. W. of E. line of Friend st. ct, ...	4
Fulton st. ct. .	On E. line Bay View ave., 12 ft. 2 in. S. from N. line of Fulton st. . . .	6
Holyoke . .	On W. line Gardiner st., 16 ft. 6 in. N. of S. side of Holyoke st.	6
Jefferson place .	On S. line Jefferson st., 8 ft. W. of E. line of Jefferson place, ... , .	2

TABLE IX.—*(Continued.)*

SHOWING THE LOCATION OF GATES SET IN 1889.

STREETS.	LOCATION.	Size. Inches.
Lillian ave.	On E. line Empire st., 13 ft. S. of N. line of Lillian ave.	6
Lynnfield	24 ft. N. of the entrance to Catholic cemetery, 30 ft. E. of W. line of Lynnfield st.	6
Market	On N. line Sea st. 32 ft. 5 in. E. of W. line of Market st.	10
Market	On N. line State st., 34 ft. 3 in. E. of W. line of Market st.	12
Market	On N. line Summer st., 27 ft. 3 in. E. of W. line of Market st.	12
Market	On S. line Liberty st., 23 ft. 7 in. E. of W. line of Market st.	12
Market	On S. line of S. Common st., 20 ft. 10 in. E. of W. line of Market st.	12
Mt. Hood	On N. line Essex st., 33 ft. 6 in. W. of E. line of Mount Hood st.	4
Oakland	1 ft. S. of N. line Boston st., 9 ft. W. of E. line of Oakland st.	4
Park ave.	On W. line Summer st., 7 ft. 6 in. S. of N. line of Park ave.	6
Pacific	On E. line Eastern ave., 16 ft. S. of N. line of Pacific st.	6
Porter st. ct.	1 ft. 6 in. E. of E. line Porter st., 9 ft. N. of S. side of Porter st. ct.	2
Shillington	7 ft. E. of W. line Lynnwood st., 11 ft. N. of S. side of Shillington ct.	2
Temple place	On N. line Summer st., 12 ft. 6 in. E. of W. line of Temple place,	2
Tower ave.	On S. line Boston st. 10 ft. E. of W. side of Tower ave.	2
Washburn	On E. line Clinton st., 19 ft. S. of N. side of Washburn st.	2
Winthrop	On N. line Hancock st., 18 ft. W. of E. line of Winthrop st.	6
Winthrop ct.	On E. line of Winthrop st., 10 ft. 6 in. N. of S. line of Winthrop ct.	2
Whitney	On line of Summer st., 10 ft. 6 in. E. of W. line of Whitney st.	4
Woodman	On W. line Cottage st., 16 ft. 6 in. S. of N. line of Woodman st.	6

TABLE X.

SHOWING THE LOCATION OF HYDRANTS SET IN 1889.

STREET.	LOCATION.
Apple	361 feet from Rockland street
Broadway	1,220 feet north from Jenness street
Broadway	1,759 feet north from Jenness street
Broadway	2,363 feet north from Jenness street
Broadway place	408 feet north from Broadway
Burrill avenue	451 feet 6 inches from Lewis street
Coburn street	94 feet 6 inches from Webster street
Hancock street	30 feet from Winthrop street
Holyoke street	506 feet 6 inches west from Gardiner street
Holyoke street	1,002 feet 6 inches west from Gardiner street
Light street	460 feet 6 inches south from Norton street
Light street	1,126 feet 6 inches south from Norton street
Lillian avenue	313 feet from Empire street
Lynnfield street	506 feet south from Forest Garden avenue
Lynnfield street	26 feet north from Forest Garden avenue
Lynnfield street	440 feet north from Forest Garden avenue
Oakland street	496 feet from Boston street
Park avenue	459 feet from Summer street
Pacific street	389 feet from Eastern avenue

Number of hydrants set in 1889	19
Number of hydrants previously set	601
Total in use January 1st, 1890	620

TABLE XI.

LEAKS ON PIPES AND HYDRANTS.

MONTH.	SIZE OF MAINS.						Hydrants.
	16	12	10	8	6	4	
January	–	–	–	1	2	6	2
February	1	–	–	1	2	3	–
March	–	–	1	–	1	5	2
April	–	–	–	1	4	3	2
May	–	–	3	4	1	1	–
June	–	1	2	–	–	2	–
July	–	2	1	–	1	2	–
August	–	–	1	–	5	3	2
September	1	–	1	–	3	–	–
October	1	–	–	–	2	10	2
November	2	–	3	–	5	6	2
December	–	–	1	2	4	5	–
Totals	5	3	13	9	30	46	12

TABLE XII.

SHOWING THE KIND, SIZE AND NUMBER OF METERS IN USE IN 1889

KIND.	4	3	2	1 1-2	1	3-4	5-8	1-2	Total.
Worthington .	–	1	6	8	73	57	33	–	178
Union . . .	4	–	2	2	14	14	14	1	51
Ball and Fitts .	–	–	–	–	6	25	9	–	40
Crown . . .	–	–	–	3	4	8	–	1	16
Duplex . . .	–	–	–	–	6	4	1	1	12
Weir	–	–	–	–	2	1	–	1	4
Gem	–	–	1	–	–	2	–	2	5
Thomson . .	–	–	–	–	2	2	–	–	4
Empire . . .	–	–	1	–	–	1	–	–	2
Parker Wells .	–	–	–	–	–	2	–	–	2
Hersey . . .	–	–	–	–	–	1	–	–	1
Frost	–	–	–	–	–	1	–	–	1
Motors . . .	–	–	–	–	–	–	–	–	6
Elevators . .	–	–	2	–	–	–	–	–	2
Totals . . .	4	1	12	13	107	118	57	6	324

Total gallons metered. 121,930,400.

METEOROLOGICAL RECORD FOR JANUARY 1889.

	8 A. M.			1 P. M.			6 P. M.			24 hours ending 8 A. M.				
		Hygrometer			Hygrometer			Hygrometer						
Date.	Barometer	Dry Bulb.	Wet Bulb.	Barometer.	Dry Bulb.	Wet Bulb.	Barometer.	Dry Bulb.	Wet Bulb.	Maximum Thermometer	Minimum Thermometer.	Daily range.	Daily mean.	Rainfall.
1	29.85	37.50	34.00	29.85	40.00	35.50	29.84	36.50	34.50	41.00	33.50	7.50	37.25	
2	29.79	34.50	32.00	29.84	39.50	36.00	29.90	38.00	35.00	40.00	33.50	6.5	36.75	
3	30.08	35.00	32.50	30.12	39.50	36.00	30.12	36.50	35.00	40.00	33.50	6.5	36.75	
4	30.09	35.00	33.00	30.12	45.00	41.50	30.14	41.50	40.00	47.50	34.00	13.50	40.75	
5	30.24	38.00	37.00	30.27	41.00	38.50	30.26	38.00	37.00	41.00	37.50	3.50	39.25	.51
6	29.98	38.00	37.00	29.84	38.50	38.00	29.75	39.00	39.00	40.00	37.50	2.50	38.75	2.61
7	29.44	39.00	39.00	29.33	37.50	36.50	29.36	39.00	38.50	39.00	36.00	3.00	37.50	.04
8	29.59	38.50	35.50	29.71	45.00	41.50	29.80	41.50	39.00	45.00	35.00	10.00	40.00	
9	29.86	37.50	35.50	29.71	42.00	41.00	29.47	45.00	45.00	55.00	37.00	18.00	46.00	.26
10	29.49	39.50	35.50	29.54	44.00	39.00	29.66	38.50	35.50	44.00	31.50	12.50	37.75	
11	29.94	32.00	29.50	29.98	38.50	34.50	30.00	34.00	31.00	38.50	28.50	10.00	33.50	
12	30.14	28.50	26.00	30.20	35.00	32.00	30.26	33.50	30.50	36.00	23.00	13.00	29.50	
13	30.37	23.50	22.00	30.37	33.00	30.00	30.34	33.00	31.00	35.00	24.00	11.00	29.50	
14	30.29	25.00	23.50	30.32	33.00	31.00	30.32	31.00	30.00	33.00	18.00	15.00	25.50	
15	30.36	19.00	16.50	30.38	33.00	30.00	30.46	34.00	30.00	35.50	19.00	16.50	27.25	
16	30.31	31.00	28.50	30.29	39.50	39.00	30.23	40.50	39.00	49.50	31.00	18.50	40.25	.11
17	29.72	50.00	49.00	29.54	52.50	52.00	29.57	52.00	51.50	54.00	31.50	19.50	44.25	.24
18	29.79	35.50	35.00	29.73	43.50	43.00	29.81	37.50	37.00	43.50	27.50	16.00	35.50	
19	30.11	26.00	25.00	30.22	20.00	19.00	30.45	15.00	12.00	26.50	7.00	19.50	16.75	
20	30.54	8.50	7.00	30.53	22.00	19.00	30.48	24.00	23.00	37.00	8.00	29.00	22.50	.48
21	29.62	37.00	36.50	29.35	35.00	34.00	29.50	32.00	30.50	42.50	8.50	34.00	25.50	.02
22	30.08	22.00	21.50	30.21	26.50	24.50	30.58	26.00	24.50	27.50	18.50	9.00	23.00	
23	30.52	19.00	18.50	30.54	32.50	31.00	30.55	34.00	32.50	34.50	19.00	15.50	26.75	
24	30.43	32.00	31.00	30.26	45.00	43.00	30.18	43.50	43.00	45.00	31.00	14.00	38.00	
25	30.14	31.00	30.50	30.12	42.50	40.00	30.12	37.50	37.00	42.00	30.50	11.50	36.25	
26	30.04	30.50	29.50	30.02	44.00	41.00	29.91	39.50	38.00	45.00	30.00	15.00	37.50	
27	29.86	33.00	32.00	29.72	38.00	36.50	29.43	37.50	37.50	37.50	29.00	8.50	33.25	
28	29.13	37.50	36.00	29.23	39.00	37.50	29.30	36.50	35.00	41.50	25.00	16.50	34.25	.71
29	29.30	25.00	24.50	29.38	26.50	25.00	29.50	23.50	21.50	27.50	13.50	14.00	20.50	
30	29.91	16.50	13.50	30.10	25.50	25.00	30.14	26.00	24.50	32.00	16.50	15.50	24.25	
31	30.21	32.00	30.50	30.09	36.50	35.50	29.54	39.00	37.50	39.00	30.50	8.50	34.75	

Monthly range	48.00		
Monthly mean		33.17	
Rainfall			4.98

METEOROLOGICAL RECORD FOR FEBRUARY 1889.

	8 A. M.			1 P. M.			6 P. M.			24 hours ending 8 A. M.				
		Hygrometer			Hygrometer			Hygrometer						
Date.	Barometer.	Dry Bulb.	Wet Bulb.	Barometer.	Dry Bulb.	Wet Bulb.	Barometer.	Dry Bulb.	Wet Bulb.	Maximum Thermometer.	Minimum Thermometer.	Daily range.	Daily mean.	Rainfall.
1	29.58	33.00	30.50	29.62	32.00	31.50	29.74	24.00	22.50	33.00	12.00	21.00	22.50	
2	29.80	19.00	17.00	29.72	30.00	20.00	29.66	31.50	28.50	32.50	19.00	13.50	25.75	
3	29.67	29.00	27.50	29.61	39.00	36.00	29.66	27.50	26.00	40.00	7.00	33.00	23.50	
4	29.86	7.00	6.00	29.94	24.00	21.00	29.94	25.50	24.50	37.00	9.00	28.00	23.00	
5	29.82	36.50	35.00	29.65	41.00	39.50	29.56	43.50	42.00	43.50	36.50	7.00	40.00	0.50
6	29.29	38.00	36.50	29.36	25.50	23.00	29.50	15.00	12.50	39.00	9.00	30.00	24.00	
7	29.12	11.00	8.50	29.69	19.00	16.50	29.80	19.50	17.50	22.50	10.50	12.00	16.50	
8	30.12	17.00	14.50	30.11	26.50	23.50	30.08	27.00	25.50	29.00	17.00	12.00	23.00	0.09
9	29.61	25.50	23.50	29.88	33.50	32.00	29.90	32.00	30.00	34.00	23.00	11.00	28.50	
10	29.95	24.50	22.50	29.98	31.00	27.50	30.04	27.00	25.00	32.00	18.00	14.00	25.00	
11	30.00	19.50	18.50	29.87	32.00	30.50	29.83	33.50	31.50	36.50	19.50	17.00	28.00	0.40
12	29.62	26.00	24.50	29.60	29.50	28.00	29.56	29.50	27.00	32.00	12.50	19.50	22.25	0.02
13	29.56	13.00	12.50	29.52	18.00	16.50	29.56	13.50	12.00	19.50	12.50	7.00	16.00	
14	29.65	16.50	14.50	29.71	28.00	25.50	29.82	24.50	25.30	29.00	16.50	12.50	22.75	
15	29.70	18.50	16.00	30.18	30.00	27.50	30.22	30.00	27.50	30.05	17.50	13.00	24.00	
16	30.38	22.00	20.50	30.35	36.00	34.00	30.28	35.00	33.00	40.00	22.50	17.50	31.25	0.35
17	29.78	37.50	37.00	29.70	42.00	40.50	29.70	45.00	43.00	44.50	38.00	6.50	41.25	
18	29.80	38.00	36.00	29.62	35.50	34.50	29.64	35.50	35.00	38.00	31.00	7.00	34.50	0.42
19	29.65	32.50	30.00	29.74	33.00	31.50	29.68	27.50	25.50	32.50	22.50	10.00	27.50	
20	30.24	23.00	21.50	30.28	29.00	27.50	30.30	26.00	25.50	23.00	17.50	5.50	20.25	
21	30.38	18.00	15.00	30.62	26.50	25.50	30.60	28.00	26.50	30.00	19.00	11.00	24.50	
22	30.37	30.00	28.50	30.18	37.50	35.50	30.08	35.00	32.50	38.00	3.00	35.00	20.50	
23	30.31	3.50	1.50	30.37	6.50	4.50	30.42	5.00	2.50	9.00	-1.00	10.00	4.00	
24	30.70	1.00	2.00	30.72	11.00	8.00	30.71	14.50	11.50	14.50	-1.00	15.50	6.75	
25	30.61	14.00	12.50	30.61	23.00	21.50	30.64	20.00	17.00	13.50	-½.00	14.00	6.50	
26	30.77	13.00	12.00	30.82	27.00	25.50	30.80	26.00	25.00	29.00	13.00	16.00	21.00	
27	30.71	28.00	27.50	30.68	33.50	31.00	30.65	31.00	30.50	33.50	28.00	5.50	30.75	0.03
28	30.58	29.00	27.50	30.60	34.00	32.50	30.56	32.50	31.00	34.50	25.50	9.00	30.00	

Monthly range - - - - - - - - - - - - - - - -	**45.5**
Monthly mean - - - - - - - - - - - - - - - -	**20.69**
Rainfall - - - - - - - - - - - - - - - - - -	**1.81**

METEOROLOGICAL RECORD FOR MARCH 1889.

	8 A. M.			1 P. M.			6 P. M.			24 hours ending 8 A. M.				
		Hygrometer			Hygrometer			Hygrometer						
Date	Barometer.	Dry Bulb.	Wet Bulb.	Barometer.	Dry Bulb.	Wet Bulb.	Barometer.	Dry Bulb.	Wet Bulb.	Maximum Thermometer	Minimum Thermometer.	Daily range.	Daily mean.	Rainfall.
1	30.48	29.00	27.50	30.43	40.50	37.50	30.41	35.50	33.50	41.00	29.00	12.00	35.00	
2	30.30	33.00	31.50	30.24	43.50	42.00	30 20	37.50	36.50	45.00	32.00	13.00	38.50	
3	30.08	39.50	36.50	30.05	43.50	39.50	30 00	39.50	37.00	43.50	35.00	8.50	39.25	
4	29.93	38.50	36.50	29.92	42 00	39.00	29.56	38 50	37.00	43.00	32.50	10.50	37.75	0.20
5	29.60	34.50	34.50	29.46	35.50	35.50	29.38	36 50	36.00	35 50	34.00	1.50	34.75	0.45
6	29.16	37.50	36.00	29.30	39.50	39.00	29.98	38.00	37.50	41.00	32.50	8.50	36.75	0.61
7	28.90	37.50	35.50	28.93	42.50	40.50	29 30	38 50	36.50	42.00	29.00	13 00	35.50	
8	29.40	32.50	31.50	29.25	36.00	35.50	29 30	30.00	28.50	36.00	27.50	8.50	31.75	
9	29.32	29.50	28.00	29.36	32.50	31.00	29 39	30.00	29 50	34.50	19.00	15.50	26.75	
10	29.51	26.00	24.00	29.52	37.50	35 50	29.56	35.00	32.00	40.00	27.00	13.00	33.50	
11	29 73	27.50	26.00	29.74	35.00	33.00	29 80	31.50	31.00	35 00	25.50	9.50	30.25	
12	29.92	30 50	29.00	29.90	44.00	42.00	29.91	43.50	42.00	46.00	30.00	16.00	38.00	
13	29.98	36.00	34.50	29.87	51.50	49.50	29.80	51.50	48.50	56.50	29.50	27.00	43.00	
14	30 18	30.00	26.50	30.28	37.00	32.50	30.29	37 50	36.00	39.00	28.50	10.50	33.75	
15	30.27	35.00	34.00	30.26	38.00	36.00	30.14	34.00	32.50	37.50	34.00	3 50	35.75	
10	29.97	35.50	34.00	29.93	38.50	37 50	29.89	39.00	36.50	38.50	31.00	7.50	34.75	0.36
17	29.84	32.50	32.00	29.85	35.00	24.00	29 85	34.00	33.50	35.00	31.50	3.50	33.25	
18	29.85	34.00	32.50	29.87	37.50	36.00	29.84	37.50	36.00	38.00	34.00	4 00	36.00	
19	29 82	37.00	35.50	29.80	41.50	39.50	29.79	38.50	37.50	43.00	33 00	10.00	38.00	
20	29.81	35.00	33.50	29.83	35 50	33.50	29.82	35.00	33.50	35.50	32 50	3 00	34.00	
21	29.81	32.50	31.00	29.83	34.00	31.50	29.85	30.50	35.00	37.00	31.50	5 50	34.25	
22	30.00	36.00	34.50	30.13	42.50	39.50	30.07	44.50	43.00	44.50	32.00	12.50	38.25	
23	30.05	40.00	38.50	29.95	53.00	50.00	29.87	50.00	45 00	55.50	37.00	18.50	46.25	
24	29.79	44.50	40 00	29.68	59.00	52.00	29.63	56.50	50 00	60 00	40.50	19.50	35.25	
25	29.63	40.50	39 50	29.65	41.50	40.00	29.65	39.00	38 50	44.50	20.00	24.50	32.25	
26	29.92	24.00	22.50	30.00	30 00	28.50	29 99	31 50	30 00	40.00	25.00	15.00	32.50	
27	30.01	40 00	37.50	29 95	50.00	47.50	29.91	45 00	43.50	50.00	40.50	9.50	45.25	0.02
28	29.70	47.00	46.50	29.69	45.00	43.50	29 76	35.00	37.00	52.50	29.50	23.00	41 00	0.12
29	29.92	35.00	34 00	29.91	45.50	44 50	29.87	43.00	42 50	47.00	27 50	19.50	37.25	0.02
30	30.05	28.00	26.50	30.17	30.50	27.50	30.24	32.00	30.50	31.00	24.00	7 00	27.50	
31	30.35	32 00	29 00	30.23	32.50	31.00	30.02	33.00	32.00	36.00	31.00	5 00	33.50	0.54

Monthly range 41.00
Monthly mean 36.27
Rainfall 2.32

METEOROLOGICAL RECORD FOR APRIL 1889.

	8 A. M.			1 P. M.			6 P. M.			24 hours ending 8 A. M.				
		Hygrometer			Hygrometer			Hygrometer						
Date.	Barometer.	Dry Bulb.	Wet Bulb.	Barometer.	Dry Bulb.	Wet Bulb.	Barometer.	Dry Bulb.	Wet Bulb.	Maximum Thermometer.	Minimum Thermometer.	Daily range.	Daily mean.	Rainfall.
1	29.83	32.50	32.00	29.89	36.50	35.50	29.90	35.00	34.50	36.00	30.50	5.50	33.25	0.80
2	29.71	34.00	32.50	29.67	39.50	37.50	29.68	43.50	42.50	43.50	34.00	9.50	38.75	
3	29.83	40.00	37.50	29.81	43.00	42.50	29.68	40.00	37.50	48.00	37.50	10.50	42.75	0.04
4	29.74	39.50	37.00	29.83	43.00	39.50	29.88	41.50	39.00	44.00	36.50	7.50	40.25	
5	29.98	38.50	36.00	30.01	43.50	40.50	30.01	38.00	36.50	43.50	32.50	11.00	38.00	
6	30.18	39.00	37.00	30.29	42.50	40.00	30.32	38.00	37.50	42.00	29.00	13.00	35.50	
7	30.42	35.50	34.00	30.44	42.50	38.50	30.42	38.50	36.00	42.00	34.00	8.00	38.00	
8	30.29	38.00	35.50	30.25	42.00	40.00	30.13	43.00	41.00	42.00	38.00	4.00	40.00	
9	29.89	42.00	40.50	29.83	51.50	49.00	29.78	46.00	43.50	51.50	39.50	12.00	45.50	
10	29.77	43.00	41.50	29.80	52.00	48.00	29.83	50.00	44.00	52.00	33.50	18.50	42.75	
11	29.94	47.50	44.00	29.90	64.00	54.00	29.84	53.50	49.00	64.00	48.50	15.50	56.25	0.02
12	29.65	55.00	52.50	29.56	64.50	61.00	29.54	62.00	58.00	64.00	41.00	25.00	52.50	0.13
13	29.60	42.00	39.50	29.62	50.00	46.50	29.73	44.00	41.50	51.00	31.00	20.00	41.00	
14	29.96	39.00	35.00	29.99	48.00	43.00	30.08	45.00	41.00	49.00	33.00	16.00	41.00	
15	30.31	43.50	41.00	30.39	45.00	41.00	30.38	41.50	40.00	49.00	33.00	16.00	41.00	
16	30.43	46.00	42.00	30.44	47.00	41.50	30.38	43.50	41.00	46.50	38.50	8.00	42.50	
17	30.26	45.00	42.50	30.21	48.50	47.00	30.09	45.00	44.00	48.50	38.00	10.50	43.25	0.62
18	29.90	46.00	46.00	30.01	52.00	51.50	30.01	50.00	49.50	54.50	46.50	8.00	50.50	0.02
19	30.07	55.50	54.50	30.07	58.00	57.50	30.07	47.50	45.50	61.50	44.50	17.00	53.00	
20	30.04	57.50	56.00	29.97	69.50	66.00	29.95	64.00	62.00	70.50	53.00	17.50	61.75	0.09
21	29.95	59.50	58.00	29.84	66.00	63.50	29.73	64.50	62.00	70.50	39.00	31.50	54.75	0.02
22	30.03	43.00	40.00	30.06	51.00	47.00	30.20	41.50	37.00	50.50	33.00	17.50	41.75	
23	30.39	40.00	37.50	30.38	51.50	47.50	30.33	47.50	45.00	51.50	40.00	11.50	45.75	
24	30.35	47.50	40.00	30.30	59.00	55.00	30.25	56.00	53.00	59.00	48.50	10.50	53.75	
25	30.12	55.00	53.50	30.07	66.50	64.00	30.14	56.50	56.00	65.50	47.50	18.00	56.50	0.01
26	29.95	51.50	51.00	29.91	52.00	51.00	29.80	50.00	49.00	53.50	46.50	7.00	50.00	1.29
27	29.60	47.50	47.00	29.55	56.50	45.50	29.45	50.50	49.50	56.00	47.50	8.50	51.75	0.10
28	29.43	51.50	51.00	29.45	58.50	57.50	29.49	56.00	54.50	59.50	47.50	12.00	53.50	
29	29.57	53.00	52.50	29.48	50.00	49.50	29.46	54.50	50.50	57.00	44.50	12.50	50.75	
30	29.60	51.00	48.50	29.62	61.00	56.50	29.71	52.00	49.00	61.00	40.00	11.00	50.50	

Monthly range - - - - - - - - - - - - - - - -	**41.50**
Monthly mean - - - - - - - - - - - - - - - -	**46.22**
Rainfall - - - - - - - - - - - - - - - - - -	**3.14**

METEOROLOGICAL RECORD FOR MAY, 1889.

Date	8 A. M.			1 P. M.			6 P. M.			24 hours ending 8 A. M.				
	Barometer.	Hygrometer		Barometer.	Hygrometer		Barometer.	Hygrometer						
		Dry Bulb.	Wet Bulb.		Dry Bulb.	Wet Bulb.		Dry Bulb.	Wet Bulb.	Maximum Thermometer	Minimum Thermometer.	Daily range.	Daily mean.	Rainfall.
1	29.82	50.50	43.00	29.82	55.50	52.00	29.85	52.50	48.00	56.00	39.50	16.50	47.75	
2	29.89	48.00	45.50	29.84	53.00	50.50	29.80	48.00	47.00	56.50	44.50	12.00	50.50	
3	29.73	47.50	46.50	29.76	53.50	51.00	29.77	48.00	47.00	53.50	40.00	13.50	46.75	
4	29.85	47.00	45.02	29.86	51.50	49.00	29.85	53.00	51.00	57.00	45.00	12.00	51.00	
5	29.96	57.00	54.00	29.89	71.50	65.00	29.86	74.00	65.50	75.00	48.00	17.00	61.50	
6	29.98	51.00	49.00	29.99	56.00	54.00	30.03	52.00	51.00	52.00	43.50	8.50	47.75	
7	30.10	48.00	[illegible]	30.07	51.00	50.50	30.01	46.00	45.00	52.50	43.00	9.50	47.75	
8	29.97	47.00	46.50	29.95	56.00	56.00	29.94	61.50	61.00	62.00	43.00	19.00	52.50	
9	29.95	62.00	61.00	29.91	79.00	73.00	29.88	73.50	71.00	78.00	43.00	35.00	60.50	
10	29.74	72.00	67.00	29.61	85.00	78.00	29.55	82.00	73.00	85.00	62.00	23.00	73.50	
11	29.62	62.50	58.00	29.64	59.00	56.00	29.65	56.00	53.00	63.00	52.00	11.00	57.50	
12	29.81	56.00	55.00	29.80	67.50	64.50	29.79	64.00	61.50	68.00	53.50	14.50	60.75	0.05
13	29.95	60.50	56.50	29.98	60.00	58.00	29.91	50.00	49.00	61.00	49.50	11.50	55.25	0.05
14	29.75	55.50	55.00	29.74	61.00	60.00	29.70	65.00	63.00	65.50	56.00	9.50	60.75	
15	29.91	61.00	57.50	29.96	63.50	60.50	29.98	60.50	57.00	66.00	51.50	14.50	58.75	
16	30.08	58.00	56.50	30.08	62.00	59.50	30.13	59.00	56.50	62.00	54.00	8.00	58.00	
17	30.23	60.00	59.00	30.24	65.50	63.00	30.23	71.50	67.50	76.00	59.50	16.50	67.75	
18	30.29	68.50	64.50	30.28	78.50	73.00	30.20	77.00	71.00	78.50	57.50	21.00	68.00	
19	30.28	64.50	62.50	30.25	74.00	68.50	30.23	72.50	69.00	75.00	58.00	17.00	66.50	0.36
20	30.11	61.50	60.00	30.06	65.00	64.00	29.97	63.50	62.50	66.00	58.00	18.00	62.00	1.52
21	29.79	63.50	63.00	29.72	61.00	61.00	29.63	60.00	59.50	67.00	59.00	8.00	63.00	0.72
22	29.68	67.00	63.00	29.69	72.00	67.00	29.72	65.50	63.00	70.00	49.50	20.50	59.75	
23	29.78	55.50	53.00	29.79	61.00	58.00	29.78	58.00	56.50	59.50	48.50	11.00	54.00	0.03
24	29.81	58.50	54.00	29.80	66.00	59.50	29.77	65.00	60.00	65.50	52.50	13.00	59.00	0.16
25	29.78	61.00	59.50	29.83	65.00	59.00	29.86	63.00	57.50	64.00	47.00	17.00	55.50	0.23
26	29.98	47.00	47.00	29.98	49.50	49.50	30.02	50.00	48.00	51.50	41.00	10.50	46.25	0.04
27	30.06	51.50	49.50	30.02	51.50	49.50	29.88	48.50	47.50	54.00	49.00	5.00	51.50	0.51
28	29.71	55.00	53.00	29.73	67.00	62.50	29.72	69.00	63.00	68.50	43.00	25.50	55.75	
29	30.05	47.50	44.00	30.11	62.00	56.00	30.15	56.00	53.00	63.00	48.00	15.00	55.50	
30	30.23	55.50	54.00	30.21	58.00	57.50	30.20	70.00	66.50	66.50	56.50	10.00	61.50	
31	30.21	63.50	61.00	30.21	74.00	70.50	30.18	69.50	66.00	72.00	68.50	3.50	70.25	0.05

Monthly range - - - - - - - - - - - - - - - - -	45.50
Monthly mean - - - - - - - - - - - - - - - - -	37.04
Rainfall - - - - - - - - - - - - - - - - -	3.72

METEOROLOGICAL RECORD FOR JUNE, 1889.

	8 A. M.			1 P. M.			6 P. M.			24 hours ending 8 A. M.				
		Hygrometer			Hygrometer			Hygrometer						
Date.	Barometer.	Dry Bulb.	Wet Bulb.	Barometer.	Dry Bulb.	Wet Bulb.	Barometer.	Dry Bulb.	Wet Bulb.	Maximum Thermometer.	Minimum Thermometer.	Daily range.	Daily mean.	Rainfall.
1	30.15	63.50	61.50	30.12	68.00	65.50	30.07	67.50	66.00	69.00	59.00	10.00	64.00	1.15
2	30.01	63.50	63.00	30.01	67.00	66 00	30.00	65.50	65.00	66.50	59.50	7.00	62.75	0.35
3	30.01	65.00	64.00	30.00	70.50	68.50	29.95	66.50	65.00	70.50	58.50	12 00	64.50	0.58
4	29.77	60 50	60.00	29.71	64.50	63.50	29.63	66 00	64.00	67.50	58 00	9.50	62.75	0.03
5	26.58	64.00	61.50	29.55	66.00	64.50	29.52	65.00	64 00	69 50	57 50	12.00	63.50	0.68
6	29.52	62.50	60.00	29.52	67.00	63 50	29.56	64.00	59.00	66.50	48.50	18.00	57.50	
7	29.78	56.00	52 00	29.81	66.50	60 00	29.82	69 00	65 50	69.00	56.00	13.00	62.50	
8	29.83	65.00	61.00	29.83	66.50	61.00	29.82	62.50	62.00	66.00	58.00	8.00	62.00	0 25
9	29.98	64.50	63.50	29.99	72 00	70.00	29.99	70.00	69.00	73.00	63.50	9.50	68.25	
10	30.04	69.50	69 00	30.03	76.00	74 00	30.04	72 00	70.00	80 00	64.50	15.50	72.25	0.15
11	30.05	72.50	70.00	30.03	80.00	76.50	30.00	74.00	72.00	80.00	66.00	14.00	73.00	0.65
12	30.07	69.00	65 50	30.11	71.00	67.50	30.10	69 00	65.50	70.50	58 50	12 00	64.50	
13	30.10	66.50	63.50	30.05	75.00	69.00	30.00	75 50	71.50	76.00	64.00	12.00	70 00	
14	30.10	71.00	70.00	30.15	80.50	73 50	30.13	70.00	67.00	79.50	62.00	15 50	70.75	
15	30.11	68.00	67.00	30 01	79.50	75 50	29.95	77.00	75.00	80.00	66.00	14 00	73.00	0.07
16	30 05	74.00	71.00	30.03	78.50	74.00	29.95	74.00	71.50	78.00	67.00	11.00	72.50	0.32
17	29.75	70.00	69 50	29 74	72.50	71.00	29.75	71.00	69.50	74.00	51.00	23.00	62 50	0.00
18	30.05	58.50	55.50	30.09	61.50	58.50	30.07	58 00	55.00	61 00	48.00	13.00	54.50	
19	30.01	59.00	56.00	29.95	62.50	61.50	29.87	59 50	57 00	64.50	54.00	10.50	59.25	
20	29.72	64 50	62.00	29.68	80.50	76 00	29.79	81.00	74.00	80.50	61.50	19.00	71.00	
21	29.95	71.50	68.00	29.92	77.50	74.00	29.88	77.00	72.50	70.00	67 00	12.0	73.00	
22	29.75	72.50	71.00	29.74	74.50	71.50	29.70	74.00	70.00	76.00	54.50	21.50	65.25	
23	30.05	62.50	59.00	30.08	67.00	63.00	30.14	76.00	68 50	71.00	54.00	17 00	62 50	
24	30.36	63.50	62.50	30.40	73 00	63 00	30 40	68.00	64.00	72.50	54.00	18.50	63.25	
25	30.43	63.50	59.00	30.43	73.00	68.50	30.38	67.00	64.00	73.00	59.00	14.00	66.00	
26	30.34	67.00	63.50	30.27	67.50	66.50	30.20	75.00	71.50	76 00	65.00	11.00	70 50	0.01
27	30.10	71.50	70.00	30.11	81.50	77.00	30.10	77.50	74 00	81.00	67 00	14.00	74.00	
28	30.16	74.50	72.00	30.17	76 50	73.50	30.11	75.00	72.00	76.00	64.00	12.00	70.00	0.94
29	30.15	71.00	67.50	30.15	76.50	73.50	30.11	71.50	70.00	76 50	65.50	11.00	71.00	
30	30.13	76.00	73.00	30.16	76.50	72.50	30.16	76.50	73.00	77.00	73.50	3 50	75.25	

Monthly range	33.00
Monthly mean	66.72
Rainfall	4.64

METEOROLOGICAL RECORD FOR JULY, 1889.

	8 A. M.			1 P. M.			6 P. M.			24 hours ending 8 A. M.				
		Hygrometer			Hygrometer			Hygrometer						
Date.	Barometer.	Dry Bulb.	Wet Bulb.	Barometer.	Dry Bulb.	Wet Bulb	Barometer.	Dry Bulb.	Wet Bulb.	Maximum Thermometer.	Minimum Thermometer.	Daily range.	Daily mean.	Rainfall.
1	30.28	70.50	68.50	30.30	76.50	73.50	30.28	72.50	69.00	76.00	63.50	12.50	69.75	0.01
2	30.31	69.00	66.50	30.31	70.50	69.00	30.24	66.00	63.00	70.50	65.00	5.50	67.75	0.17
3	30.17	70.50	69.00	30.13	75.00	73.50	30.05	73.00	68.00	75.00	68.50	6.50	71.75	0.49
4	29.87	75.00	73.00	29.86	75.00	74.00	29.85	68.00	66.50	75.50	62.00	13.50	68.75	0.16
5	29.98	69.00	65.00	29.97	72.50	69.00	30.00	70.00	67.00	72.50	58.50	14.00	65.50	
6	30.18	68.00	64.00	30.19	71.50	66.00	30.15	72.00	68.00	72.50	61.00	11.50	66.75	
7	30.14	70.00	66.50	30.10	74.50	69.00	30.06	73.50	71.00	74.50	66.50	8.00	70.50	
8	29.92	72.00	69.50	29.90	79.50	72.00	29.89	68.00	65.00	79.50	61.50	18.00	70.50	
9	30.01	67.00	64.00	30.03	65.50	63.50	30.03	62.00	60.00	67.00	60.00	7.00	63.50	
10	30.05	64.50	62.00	30.05	69.50	67.50	30.03	64.00	62.00	69.50	61.50	8.00	65.50	
11	30.00	66.50	65.50	29.95	63.50	62.00	29.92	62.00	61.50	68.00	62.00	6.00	65.00	0.05
12	29.94	68.00	67.00	29.95	68.50	67.50	29.90	68.00	67.00	71.00	62.50	8.50	66.75	
13	29.96	71.00	69.00	29.92	77.50	76.00	29.84	76.00	74.00	79.00	68.50	10.50	73.75	
14	29.80	76.00	75.00	29.81	79.00	76.00	29.81	75.50	73.50	80.00	60.00	20.00	70.00	0.09
15	29.82	61.00	61.00	29.77	60.50	60.50	29.74	57.50	57.00	61.50	51.50	10.00	56.50	0.51
16	29.86	63.50	62.00	29.86	75.00	72.50	29.8	73.00	71.00	75.00	62.50	12.50	68.75	
17	29.82	70.00	69.00	29.83	72.00	71.00	29.83	69.00	67.50	72.00	57.00	15.00	64.50	0.23
18	29.93	67.50	67.00	29.95	71.50	71.50	29.93	70.00	68.50	71.50	56.50	15.00	64.00	
19	29.93	68.50	65.00	29.91	74.50	69.50	29.88	74.00	69.50	75.00	57.00	18.00	66.00	0.41
20	29.72	67.50	66.00	29.65	67.00	67.00	29.64	76.00	72.50	76.00	63.00	13.00	69.50	0.72
21	29.82	70.00	67.00	29.83	78.00	72.00	29.84	78.00	71.00	78.00	62.50	15.50	70.25	
22	29.94	69.00	65.00	29.94	70.00	66.00	29.94	67.50	66.00	76.50	62.50	14.00	69.50	
23	29.84	70.00	66.50	29.71	72.50	69.00	29.69	73.00	71.00	73.00	56.50	16.50	64.75	0.87
24	29.81	65.00	61.00	29.81	72.00	67.00	29.57	67.00	63.50	72.00	55.50	16.50	63.75	
25	30.01	64.50	59.00	30.03	71.50	64.00	30.02	74.00	66.50	74.00	58.00	16.00	66.00	
26	30.11	68.00	64.50	30.12	70.00	65.50	30.12	68.00	65.00	70.00	61.00	9.00	65.50	
27	30.05	63.50	62.50	29.91	61.50	64.00	29.86	63.50	62.00	63.50	58.00	5.50	60.75	1.77
28	29.95	63.50	62.50	30.00	67.00	65.00	30.00	64.00	62.00	70.00	58.00	12.00	64.00	0.50
29	30.00	71.00	70.00	29.98	80.00	77.00	29.97	77.00	74.50	80.00	69.00	11.00	74.50	0.01
30	30.06	76.00	74.00	30.04	80.50	77.00	30.08	74.00	72.00	80.50	68.50	12.00	74.50	0.72
31	30.15	73.50	72.00	30.16	80.00	76.00	30.18	74.00	72.00	80.00	69.50	10.50	74.75	0.89

Monthly range - - - - - - - - - - - - - - - -	29.00
Monthly mean - - - - - - - - - - - - - - - -	67.52
Rainfall - - - - - - - - - - - - - - - - - -	7.60

METEOROLOGICAL RECORD FOR AUGUST, 1889.

	8 A. M.			1 P. M.			6 P. M.			24 hours ending 8 A. M.				
		Hygrometer			Hygrometer			Hygrometer						
Date	Barometer	Dry Bulb.	Wet Bulb	Barometer.	Dry Bulb.	Wet Bulb.	Barometer.	Dry Bulb.	Wet Bulb.	Maximum Thermometer	Minimum Thermometer.	Daily range.	Daily mean.	Rainfall.
1	30.19	73.00	72.00	30.14	75.00	73.00	30.08	75.00	72.50	74.50	68.50	6.00	71.50	0.94
2	30.15	74.50	72.00	30.04	79.50	76.00	29.99	76.50	74.00	79.50	69.50	10.00	74.50	
3	30.01	74.50	72.00	30.01	72.50	70.00	29.95	75.00	72.50	74.50	66.00	8.50	70.25	0.15
4	30.02	71.50	68.50	30.04	78.00	70.00	30.05	70.00	71.00	78.00	64.50	13.50	71.25	
5	30.10	68.50	66.50	30.04	65.50	64.50	30.04	62.00	61.50	68.00	64.50	3.50	66.25	0.10
6	30.16	64.50	62.50	30.11	64.50	63.50	30.12	65.00	63.00	65.00	58.00	7.00	61.50	
7	30.07	65.00	62.00	30.07	71.50	67.50	30.06	66.00	63.00	71.50	53.50	18.00	62.50	
8	30.12	63.50	60.00	30.15	68.50	65.50	30.13	66.00	63.50	68.50	59.00	9.50	63.75	
9	30.10	67.50	67.00	30.03	74.50	70.00	29.99	73.00	72.00	74.50	63.00	11.50	68.75	0.47
10	29.89	70.00	65.00	29.85	75.00	73.50	29.82	76.00	74.00	74.50	58.00	16.50	66.25	0.07
11	29.88	64.50	61.50	29.89	71.00	64.00	29.91	67.00	61.00	71.00	52.00	19.00	61.50	
12	30.04	61.00	60.00	30.05	68.00	65.50	30.04	69.00	65.50	69.50	58.00	11.50	63.75	
13	30.08	66.50	62.00	30.10	61.00	61.00	30.10	[illegible]	63.50	67.00	62.00	5.00	64.50	1.15
14	30.00	63.50	62.00	29.87	62.50	62.50	29.79	66.50	64.00	67.50	57.00	10.50	62.25	0.83
15	29.76	58.50	54.00	29.77	61.50	60.50	29.78	62.00	59.50	65.50	56.00	9.50	60.75	
16	29.83	61.50	59.00	29.84	71.50	65.00	29.84	72.00	68.00	72.50	53.50	19.00	63.00	
17	29.93	61.50	61.50	29.94	72.50	65.00	29.94	73.00	69.50	72.50	56.00	16.50	64.25	
18	30.08	64.50	61.00	30.04	73.00	67.00	30.03	[illegible]	66.50	72.50	57.50	15.00	65.00	
19	30.04	66.00	63.00	30.02	75.50	67.00	29.98	74.50	70.00	75.50	64.00	11.50	69.75	
20	29.94	67.00	65.00	29.93	73.00	67.50	29.92	72.00	69.50	73.00	64.50	8.50	68.75	
21	29.95	69.50	65.50	29.95	72.50	67.50	29.90	69.00	66.50	72.50	65.50	7.00	69.00	
22	29.80	74.00	71.00	29.83	78.50	97.00	29.78	74.00	70.00	78.50	61.50	17.00	70.00	
23	30.00	67.00	63.50	30.03	71.00	69.00	30.01	69.00	66.50	78.00	61.00	17.00	69.50	0.22
24	30.07	64.50	64.00	30.11	67.00	64.00	30.14	67.50	65.50	68.00	60.00	8.01	64.00	0.66
25	30.21	71.00	64.00	30.22	68.00	65.00	30.21	64.00	61.00	68.50	60.00	8.50	64.25	
26	30.29	62.50	60.00	30.32	66.50	60.50	30.32	62.50	59.50	66.50	51.50	15.00	59.00	
27	30.37	58.50	56.50	30.36	64.00	61.00	30.31	62.50	59.00	63.50	49.00	14.50	56.25	
28	30.27	50.00	57.50	30.29	63.50	59.50	30.25	62.50	60.00	63.50	52.00	11.50	57.75	
29	30.19	60.00	58.50	30.19	68.00	64.00	30.15	63.00	60.50	67.50	57.50	10.00	62.50	
30	30.13	62.00	61.00	30.11	71.50	68.50	30.09	68.00	65.50	71.50	57.00	14.50	64.25	
31	30.13	71.00	66.00	30.17	74.50	69.00	30.21	70.50	66.50	72.50	60.50	12.00	66.50	

Monthly range	30.00
Monthly mean	65.27
Rainfall	3.99

METEOROLOGICAL RECORD FOR SEPTEMBER, 1889.

	8 A. M.			1 P. M.			6 P. M.			24 hours ending 8 A. M.				
		Hygrometer			Hygrometer			Hygrometer						
Date.	Barometer.	Dry Bulb.	Wet Bulb.	Barometer.	Dry Bulb.	Wet Bulb.	Barometer.	Dry Bulb.	Wet Bulb.	Maximum Thermometer.	Minimum Thermometer.	Daily range.	Daily mean.	Rainfall.
1	30.32	63.00	59.50	30.33	69.50	62.00	30.32	63.00	60.00	69.50	57.00	12.50	63.25	
2	30.30	62.00	58.50	30.27	72.00	66.50	30.22	66.00	64.00	72.00	57.00	15.00	64.50	
3	30.17	66.00	63.00	30.15	76.00	71.00	30.11	74.50	71.50	76.50	58.50	18.50	67.75	
4	30.15	67.00	63.50	30.25	74.50	69.50	30.16	73.50	70.50	74.50	60.00	14.50	67.25	
5	30.15	67.50	65.00	30.15	74.50	68.50	30.11	73.00	70.00	74.00	60.00	14.00	67.00	
6	30.12	73.50	70.00	30.11	79.00	74.00	30.08	76.50	73.50	79.00	66.00	13.00	72.50	
7	30.17	67.00	66.50	30.18	70.00	67.50	30.18	66.50	64.00	72.00	61.00	11.00	66.50	
8	30.18	62.00	61.00	30.18	66.50	63.50	30.18	64.00	62.50	68.00	58.50	9.50	63.25	
9	30.21	62.00	61.50	30.23	65.50	63.50	30.21	62.00	61.50	65.50	58.00	7.50	61.75	
10	30.17	62.50	61.50	50.17	67.00	63.50	30.18	62.50	60.50	66.50	59.00	7.50	62.75	
11	30.11	60.50	60.00	30.13	61.00	61.00	30.11	62.50	60.50	62.50	60.00	2.50	61.25	0.29
12	30.11	63.00	61.00	30.15	66.00	62.00	30.15	62.00	59.50	65.50	60.00	5.50	62.75	0.01
13	30.25	64.00	61.50	30.28	67.00	63.50	30.27	64.00	62.00	66.50	61.00	5.50	63.75	0.52
14	30.27	65.00	63.50	30.27	68.00	65.50	30.26	65.50	63.00	67.50	63.00	4.50	65.25	0.15
15	30.22	66.50	66.00	30.20	71.50	69.00	30.14	68.50	68.00	71.50	66.50	5.00	69.00	0.05
16	30.09	72.00	69.50	30.07	75.50	72.50	30.04	73.00	70.50	75.50	68.50	7.00	72.00	
17	30.04	72.50	69.50	30.00	76.00	73.00	29.95	73.50	70.50	75.50	63.00	12.50	69.25	0.65
18	29.85	66.00	63.50	29.81	71.00	69.00	29.82	63.00	61.50	70.50	50.00	20.50	60.25	0.71
19	29.48	51.50	50.50	29.50	58.50	54.50	29.52	57.50	56.00	59.00	47.00	12.00	53.00	0.07
20	29.59	56.00	51.00	29.54	65.00	61.00	29.53	61.50	58.50	65.00	54.00	11.00	59.50	0.17
21	29.43	62.00	59.00	29.41	65.50	60.50	29.40	62.50	60.00	64.50	44.50	20.00	54.50	0.10
22	29.71	49.50	45.00	29.73	53.50	47.50	29.79	50.00	45.00	55.00	41.00	14.00	48.00	
23	29.93	48.00	43.00	29.94	60.00	53.00	29.94	58.50	55.00	61.50	43.00	18.50	52.25	
24	30.07	52.50	48.50	30.08	61.00	55.00	30.05	60.50	59.00	61.00	50.00	11.00	55.50	
25	30.09	62.00	58.50	30.12	65.00	61.00	30.09	59.50	57.50	65.00	57.50	7.50	61.25	
26	29.98	63.00	59.50	29.84	63.00	62.00	29.77	65.50	64.00	66.00	48.50	17.50	57.25	0.05
27	29.86	51.00	48.50	29.87	57.50	51.50	29.90	54.50	51.00	58.50	42.00	16.50	50.25	
28	30.11	47.00	45.00	30.03	57.00	52.50	30.13	55.50	52.50	56.50	42.00	14.50	49.25	
29	30.15	46.00	42.50	30.15	55.00	51.00	30.14	6 00	52.50	59.00	46.50	12.50	52.75	
30	30.11	62.00	60.00	30.05	68.50	66.00	30.10	62.00	60.50	68.50	46.50	22.00	57.50	0.18

Monthly range	38.00
Monthly mean	61.02
Rainfall	2.95

METEOROLOGICAL RECORD FOR OCTOBER, 1889.

	8 A. M.			1 P. M.			6 P. M.			24 hours ending 8 A. M.				
		Hygrometer			Hygrometer			Hygrometer						
Date	Barometer	Dry Bulb.	Wet Bulb	Barometer.	Dry Bulb.	Wet Bulb.	Barometer.	Dry Bulb.	Wet Bulb.	Maximum Thermometer	Minimum Thermometer.	Daily range.	Daily mean.	Rainfall.
1	29.72	63.00	61.50	29.57	66.00	64.00	29.55	66.00	63.50	66.50	52.50	14.00	59.50	
2	29.60	59.00	56.50	29.70	63.00	60.00	29.82	53.50	49.50	63.50	39.00	24.50	51.25	
3	30.03	44.00	41.50	30.02	57.50	54.50	30.00	53.00	50.00	57.50	44.00	13.50	50.75	
4	29.99	61.50	57.00	29.98	65.00	59.00	30.00	59.00	54.00	64.00	38.00	26.00	51.00	
5	30.09	44.00	42.50	30.11	51.50	48.50	30.08	48.50	46.00	53.00	44.50	8.50	48.75	
6	30.02	54.00	51.50	29.97	55.50	53.50	29.93	56.00	55.00	56.00	52.50	3.50	54.25	0.57
7	29.60	52.50	51.50	29.61	56.00	54.50	29.60	53.50	52.50	55.50	38.00	17.50	46.75	0.02
8	29.80	42.50	41.00	29.89	51.50	46.50	29.90	46.50	46.00	51.50	38.50	13.00	45.00	
9	29.90	45.50	42.00	29.87	57.50	51.00	29.86	51.00	48.00	57.50	46.50	11.00	52.00	
10	29.78	48.00	46.50	29.76	50.50	47.00	29.80	49.50	46.00	50.50	34.50	16.00	42.50	
11	29.92	43.50	42.00	29.92	53.50	48.50	29.90	52.50	50.00	54.00	39.00	15.00	46.50	
12	29.97	46.00	43.00	29.97	54.50	51.00	29.98	52.50	50.0	54.50	42.00	12.50	48.25	1.23
13	30.03	42.00	41.50	30.05	45.00	43.00	30.06	45.00	43.00	45.00	40.00	5.00	42.50	0.00
14	30.00	41.00	40.00	29.95	45.00	43.50	29.90	43.50	42.50	46.00	41.00	5.00	43.50	0.23
15	29.03	46.00	42.00	29.94	51.50	48.50	29.95	48. 0	46.50	54.00	37.00	17.00	45.50	
16	30.11	45.50	40.00	30.12	51.00	49.50	30.12	47.50	45.50	51.00	33.50	17.50	42.25	
17	30.09	40.00	38.50	30.05	51.00	47.00	30.00	49.00	47.50	51.00	40.00	11.00	45.50	
18	29.93	46.00	42.30	29.94	56.50	50.50	29.95	52.00	46.00	56.50	35.00	21.50	45.75	
19	30.12	42.00	40.00	30.11	58.50	50.50	30.10	53.00	51.00	58.50	45.00	13.50	51.75	
20	29.95	56.00	54.00	29.90	67.00	62.00	29.90	59.00	57.00	66.50	43.50	23.00	55.00	
21	30.09	43.00	41.50	30.13	41.00	38.50	30.14	42.00	40.50	46.00	31.00	15.00	38.50	
22	30.24	36.00	32.00	30.27	46.50	41.50	30.24	43.50	41.50	46.50	32.00	14.50	39.25	
23	30.31	35.00	33.50	30.35	39.50	36.50	30.35	38.50	36.50	39.50	29.50	10.00	34.50	
24	30.35	32.50	30.00	30.33	42.00	39.50	30.27	41.00	39.50	43.50	31.00	12.50	37.25	
25	30.09	41.50	41.00	30.03	47.50	45.00	30.00	45.00	44.50	47.50	41.00	6.50	44.25	
26	29.98	43.50	42.00	30.00	54.50	50.50	30.00	52.00	50.50	54.50	44.00	10.50	49.25	
27	30.06	51.50	49.50	30.00	52.00	50.00	29.87	51.50	51.50	54.50	49.50	5.00	52.00	1.33
28	29.07	53.00	51.00	29.68	57.50	55.00	29.72	55.50	42.50	57.50	44.00	13.50	50.75	0.20
29	29.87	44.50	44.00	29.93	42.50	41.50	29.99	41.50	40.00	44.50	38.50	6.00	41.50	0.13
30	30.04	39.50	37.50	30.09	47.00	45.00	30.10	44.50	42.00	47.50	42.00	5.50	44.75	
31	30.11	41.50	39.50	30.12	48.50	45.50	30.10	46.00	43.50	52.00	40.00	12.00	46.00	0.17

Monthly range	**37.00**
Monthly mean	**46.65**
Rainfall	**3.94**

METEOROLOGICAL RECORD FOR NOVEMBER, 1889.

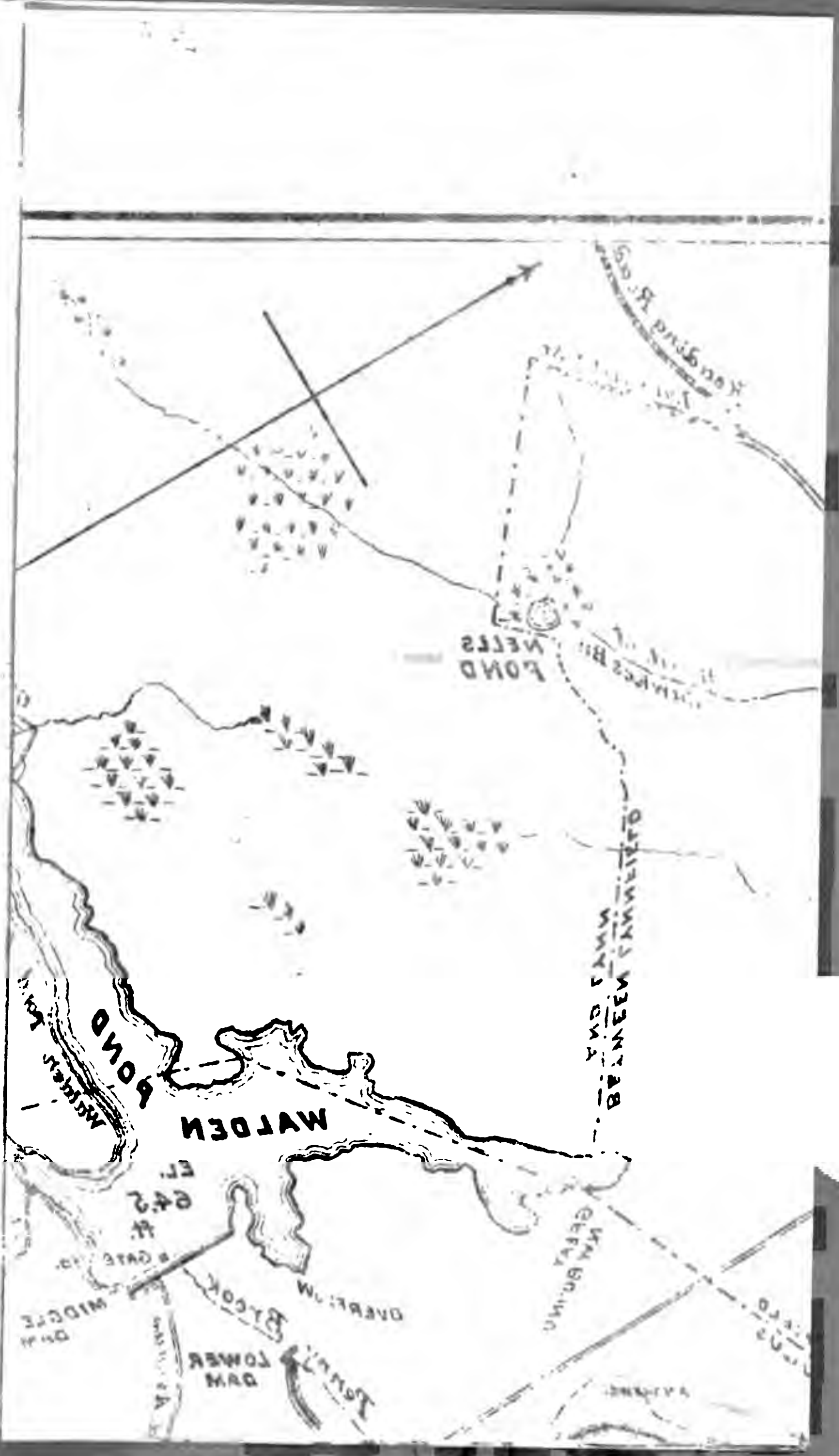
	8 A. M.			1 P. M.			6 P. M.			24 hours ending 8 A. M.				
		Hygrometer			Hygrometer			Hygrometer						
Date.	Barometer.	Dry Bulb.	Wet Bulb.	Barometer.	Dry Bulb.	Wet Bulb.	Barometer.	Dry Bulb.	Wet Bulb.	Maximum Thermometer.	Minimum Thermometer.	Daily range.	Daily mean.	Rainfall.
1	30.12	45.50	44.50	30.15	51.00	49.00	30.18	49.50	47.50	51.00	45.50	5.50	48.25	0.01
2	30.20	48.50	45.50	30.19	54.00	52.00	30.14	53.50	51.00	60.00	49.00	11.00	54.50	0.01
3	29.84	61.50	61.00	29.80	59.00	57.50	29.86	55.00	54.00	62.50	38.50	24.00	50.50	0.30
4	30.06	43.50	40.00	30.08	54.00	48.50	30.10	49.50	46.00	54.00	40.00	14.00	47.00	
5	30.11	41.50	38.50	30.11	44.50	41.00	30.11	43.00	41.50	44.50	32.00	12.50	38.25	
6	30.09	38.00	36.50	30.08	46.00	43.00	30.09	41.00	38.50	45.50	32.50	13.00	39.00	
7	30.01	38.00	36.50	29.96	53.00	48.00	29.95	48.00	46.50	52.50	37.00	15.50	44.75	
8	30.11	47.00	43.00	30.15	47.00	44.00	30.16	46.00	43.50	49.00	45.50	3.50	47.25	
9	29.96	49.50	48.00	29.90	53.50	52.00	29.90	53.00	51.00	53.50	43.00	10.50	48.25	0.23
10	29.93	43.00	42.00	29.91	38.00	37.50	29.91	38.00	37.00	43.00	31.50	11.50	37.25	0.16
11	30.06	32.00	29.50	30.10	47.50	45.00	30.10	45.50	42.50	48.00	32.00	16.00	40.00	0.02
12	30.15	46.00	45.50	30.17	51.00	48.50	30.16	52.50	50.00	53.00	45.50	7.50	49.25	
13	30.05	51.00	49.50	29.91	51.50	51.50	29.72	51.50	51.00	52.00	48.50	3.50	50.25	0.51
14	29.63	48.50	47.50	29.63	60.00	55.50	29.02	54.50	51.50	60.00	37.00	23.00	48.50	
15	29.84	37.00	34.00	29.95	36.00	33.50	30.10	29.50	28.00	36.00	21.00	15.00	28.50	
16	30.44	21.50	19.50	30.49	32.50	29.50	30.50	32.00	29.00	34.00	21.50	12.50	27.75	
17	30.46	26.00	23.00	30.38	41.00	36.00	30.32	37.50	33.00	44.50	26.50	18.00	35.50	
18	30.26	34.50	32.00	30.27	47.50	45.50	30.25	42.50	41.00	47.50	32.50	15.00	40.00	
19	30.13	45.50	43.00	30.09	48.00	46.50	30.00	47.50	46.50	48.50	40.50	8.00	44.50	1.19
20	29.67	47.00	45.50	29.69	50.50	49.50	29.70	48.00	45.50	51.00	42.00	9.00	46.50	0.12
21	29.70	46.00	43.00	29.68	51.00	47.00	29.66	48.00	46.50	51.00	44.00	7.00	40.50	0.39
22	29.28	44.50	43.00	29.31	48.50	46.00	29.38	48.50	46.00	50.00	41.50	8.50	45.75	0.01
23	29.56	44.50	42.50	29.64	51.00	47.50	29.78	48.50	44.50	49.50	38.59	11.00	44.00	
24	30.10	40.00	38.00	30.11	47.50	44.00	30.08	47.00	44.00	47.50	40.00	7.50	43.75	
25	30.08	43.50	41.50	30.09	50.00	47.00	30.10	46.00	43.50	50.00	27.50	22.50	38.75	
26	30.42	27.50	24.50	30.48	35.50	33.00	30.26	32.50	31.50	37.50	27.00	10.50	32.25	
27	30.54	29.50	28.00	30.47	36.50	34.50	30.39	37.50	36.00	49.00	29.50	19.50	39.25	1.72
28	29.64	49.00	48.50	29.39	54.00	53.50	29.54	49.00	46.50	56.00	35.00	21.00	45.50	0.99
29	29.74	35.50	32.50	29.74	43.00	41.00	29.76	37.50	36.00	43.50	28.00	15.50	35.75	
30	29.96	31.00	29.50	30.06	33.00	30.50	30.24	29.50	26.50	43.50	20.00	23.50	31.75	

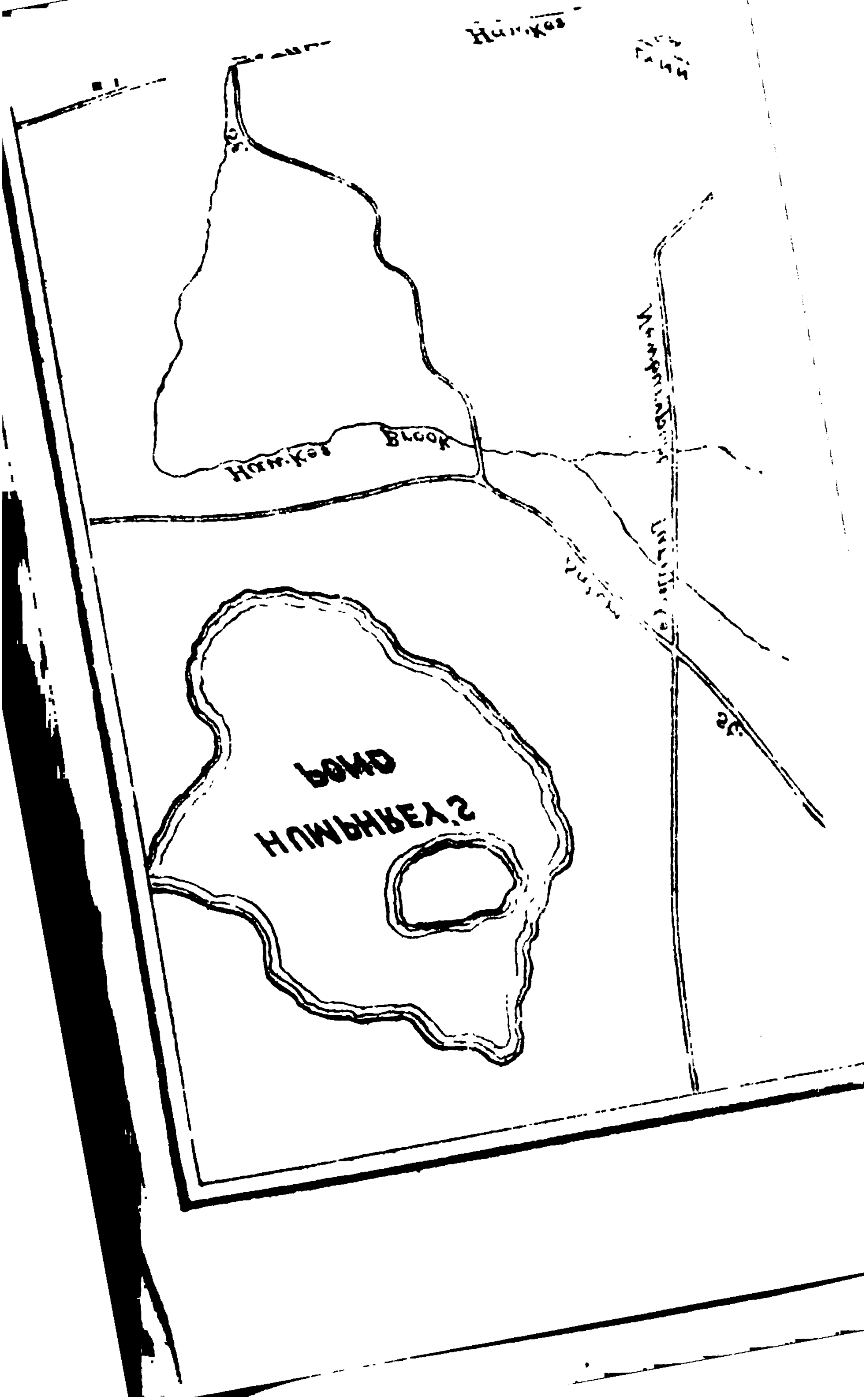
Monthly range 42.50
Monthly mean 42.33
Rainfall 5.75

METEOROLOGICAL RECORD FOR DECEMBER, 1889.

Date	8 A. M.			1 P. M.			6 P. M.			24 hours ending 8 A. M.				
		Hygrometer			Hygrometer			Hygrometer						
	Barometer.	Dry Bulb.	Wet Bulb	Barometer.	Dry Bulb.	Wet Bulb.	Barometer.	Dry Bulb.	Wet Bulb.	Maximum Thermometer	Minimum Thermometer.	Daily range.	Daily mean.	Rainfall.
1	30.37	26.50	25.00	30.35	42.00	38.50	30.35	38.50	36.00	42.00	27.00	15.00	34.50	
2	30.12	37.50	33.50	29.97	49.50	44.50	29.98	45.00	42.50	49.50	40.50	9.00	45.00	
3	29.88	41.00	39.50	29.93	33.50	31.50	30.08	27.50	25.00	33.50	10.00	23.50	21.75	0.07
4	30.34	11.50	10.00	30.41	19.00	17.00	30.43	17.50	15.50	28.00	10.00	18.00	19.00	
5	30.40	28.50	28.00	30.21	37.50	36.00	30.16	36.50	35.00	41.50	28.00	13.50	34.75	0.10
6	29.89	38.00	34.50	29.89	39.50	37.50	29.89	33.00	32.00	40.00	25.00	15.00	32.50	
7	29.97	30.00	28.00	29.91	44.50	40.50	29.92	42.00	39.50	41.50	30.50	14.00	37.50	
8	30.13	33.50	32.00	30.17	44.50	43.00	30.18	46.00	45.00	51.50	32.50	19.00	42.00	0.35
9	30.00	52.00	49.50	30.03	59.50	57.50	30.08	53.00	51.00	59.50	36.50	23.00	48.00	0.01
10	30.30	37.00	35.00	30.35	45.50	43.50	30.35	42.00	39.50	45.50	37.50	8.00	41.50	
11	29.98	43.50	42.00	29.71	48.00	46.50	29.73	47.00	44.50	47.50	36.50	11.00	42.00	0.16
12	29.88	36.50	33.50	29.95	43.00	38.50	30.04	39.50	35.50	43.00	35.50	7.50	39.25	
13	29.89	42.00	38.00	29.71	51.50	49.00	29.82	48.50	45.50	51.50	22.50	29.00	37.00	
14	30.25	22.50	18.50	30.19	23.50	21.50	30.10	21.00	19.50	32.50	10.50	22.00	21.50	0.28
15	30.20	17.00	15.00	30.19	26.50	24.50	30.18	26.50	25.00	27.50	17.00	10.50	22.25	
16	30.19	24.00	22.50	30.25	36.00	33.50	30.22	32.00	29.50	37.00	24.00	13.00	30.50	
17	30.17	34.00	31.00	30.21	41.00	38.00	30.25	37.50	34.00	42.00	35.00	7.00	38.50	
18	30.30	42.00	40.00	30.30	43.00	42.00	30.28	43.50	41.50	45.00	41.50	3.50	43.25	0.67
19	29.89	42.50	41.00	29.84	50.00	48.00	29.88	44.50	42.50	50.00	37.50	12.50	43.75	
20	29.92	37.50	34.50	29.86	51.50	49.00	29.80	48.00	46.50	52.50	37.50	15.00	45.00	
21	29.94	41.50	39.50	30.05	46.50	42.00	30.20	39.00	36.00	45.00	29.50	15.50	37.25	
22	30.22	32.50	31.00	29.97	40.50	39.00	29.85	36.50	35.50	44.00	31.50	12.50	37.75	0.16
23	30.10	35.00	32.50	30.17	40.00	36.50	30.30	34.00	32.50	38.50	28.00	10.50	33.25	
24	30.33	31.00	28.00	30.31	41.50	39.00	30.31	41.00	39.00	44.00	32.00	12.00	38.00	0.40
25	29.84	44.50	43.00	29.71	59.00	54.00	29.65	41.50	40.00	60.00	40.00	20.0	50.00	
26	29.61	41.00	39.00	29.22	47.00	46.00	29.24	42.00	40.00	51.50	27.00	24.50	39.25	0.01
27	29.67	27.00	23.00	29.60	31.50	28.50	29.72	28.50	27.50	32.00	27.50	4.50	29.75	
28	29.81	27.50	23.50	29.87	41.00	39.00	30.00	36.50	33.50	40.00	25.50	14.50	32.75	
29	30.23	26.50	25.00	30.18	37.00	35.00	30.03	42.00	41.00	50.00	26.50	23.50	38.25	0.04
30	29.00	44.50	42.00	30.08	41.50	38.50	30.34	33.00	30.50	44.50	18.00	26.50	31.25	
31	30.70	18.00	13.50	30.79	27.50	26.00	30.85	25.00	23.50	34.00	18.00	16.00	26.00	

Monthly range 50.00
Monthly mean 35.90
Rainfall 2.35


WALDEN POND
EL. 645 ft.
NELLS POND
LOWER DAM
MIDDLE DAM
OVERFLOW
Brook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POND
Hawkes Brook
Hawkes
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NINETEENTH ANNUAL REPORT

OF THE

PUBLIC WATER BOARD

OF THE

CITY OF LYNN,

For the Year Ending December 20, 1890.

LYNN, MASS.:
WHITTEN & CASS, PRINTERS.
1891.

NINETEENTH ANNUAL REPORT

OF THE

PUBLIC WATER BOARD

OF THE

CITY OF LYNN,

For the Year Ending December 20, 1890.

LYNN, MASS.:
WHITTEN & CASS, PRINTERS.
1891.

OFFICERS FOR 1890.

David Knox, *President*,
For one year.

Edwin Bates,
For two years.

E. B. Billings,
For three years.

Quincy A. Towns,
For four years.

W. B. LITTLEFIELD,
For five years.

Superintendent and Clerk, **John C. Haskell**.
Water Registrar, **Wallace O. Mudge**.
Pumping Engineer, **W. H. Messinger**.
Foreman of Piping, **Edwin Maxwell**.
Foreman of Services, **Henry Wheelock**.
Inspectors, **Winslow J. Rowell**, **W. B. Moulton**, **J. Frank Pool**.

PUBLIC WATER BOARD FOR 1891.

Edwin Bates, for one year.
Edward B. Billings, for two years.
Quincy A. Towns, for three years.
W. B. Littlefield, for four years.
David Knox, for five years.

ANNUAL REPORT.

Office of the Public Water Board,
January 1, 1891.

To the Honorable Mayor and City Council of the City of Lynn :

The Public Water Board hereby presents to the City Council its nineteenth annual report; also the reports of the Superintendent and Registrar, which give in detail the practical working of the department, and which contain much information and many tables of general interest.

THE NEW PONDS.

As was to have been expected, both Glen Lewis and Walden Ponds, having been filled for the first time, developed a considerable growth of algæ during the hot months of last summer, and singular to say, Glen Lewis Pond, which has the deepest water and has a large number of springs and abrupt shores, was much the worse of the two. Fortunately it was not found necessary to take any of the waters of these ponds for domestic use during the past year, and it is to be hoped that they shall have purged themselves free from all impurities before they are drawn upon for use.

Considerable work was done during the year in finishing up the dams and cleaning the shores, and more yet remains to be done. As soon as practicable the waters of Walden Pond should be drawn down sufficiently low to allow of all the stumps and loam to be taken out of the shallow bend where Penny Brook empties into the pond, thus deepening the pond and cleaning up the shore, and removing the only unsightly disfigurement of this beautiful sheet of water. The road also should be raised in one or two places.

CONNECTING THE PONDS.

The supply main from Walden Pond, as at present arranged, empties into the canal. The only way, therefore, in which the waters of these ponds can be utilized is by running the water into the canal and through the main under Birch Pond to the pumping well at the pumping station. If, however, the pipe was continued through the tunnel and connected with the pipe in the upper gate house at Birch Pond, then the storm waters of the new ponds could be utilized to fill the lower ponds. The immediate necessity for doing this now is not very pressing, but the system will not be complete until this is done.

CONSTRUCTION.

The work of construction the last year, has been largely confined to erecting the new Loretz pumping engine, laying the new force main up over the hill to the reservoir, and laying and extending the mains in such streets as was ordered by the City Council.

THE NEW FORCE MAIN.

Putting in a larger pumping engine, necessitated the laying of a larger force main to the reservoir. This was a work of no little difficulty or danger, especially when the trench had for 1,337 feet to be blasted out of solid ledge, and that within a few feet of the old cement-lined force main, any injury to which would have resulted in temporarily cutting off the city's water supply. Happily it was successfully accomplished, and that without the slightest accident happening to any one employed in the work.

THE NEW PUMPING ENGINE.

The new pumping engine is what is known as a ten million gallon Loretz high duty engine, is of the duplex, vertical, compound beam rotative type, and arranged and proportioned to work the steam expansively twenty-four times its original volume from an initial pressure of eighty to ninety pounds.

There are four steam cylinders, each fitted with an independent variable expansion gear, and arranged in tandem pairs, of eighteen and thirty six inches diameter by sixty-six inches stroke.

The pumps are somewhat novel and of unusual construction, being four in number, twenty-four inches in diameter by thirty-three inches stroke, and arranged and constructed to avoid the reversal of the moving column of water between intake and discharge, dispensing with the reciprocating action of ordinary pumps, which produce such strains and jars due to reaction.

In this engine are combined the principle of a moderate and continuous pump speed, with quick strokes of steam pistons and high steam pressure with fixed high degree of compound expansion; the latter being now considered the most successful manner in working steam.

The pumps work without noise or jar, and show a perfect and uniform delivery on the thirty-inch discharge main. The entire engine is similar but larger than the Croton Bay engine at Sing Sing, New York, which has achieved such a record for duty and smoothness in action, and which the Water Board had so critically examined before the present engine was contracted for.

There is every reason to believe that the results of this engine will exceed those of the Croton Bay, as many additions and improvements have been added.

The contractor, Mr. A. J. L. Loretz, has been somewhat delayed with the starting of his engine, due to various alterations and additions in the building and foundations which were found to be necessary; also in laying a new thirty-inch force main from his engine to the reservoir, considerable more rock excavations had to be made than was anticipated.

The steam for the new Loretz engine is supplied by the old boilers that have supplied the Leavitt engine for the last seventeen years.

It would be desirable to have new boilers for this engine, as the pressure of steam now generated is not sufficiently high to operate the new engine in its most economical manner, it not being considered safe to increase the pressure on these boilers which have been in constant use for so many years.

Great credit is due Mr. Messinger, the engineer in charge of the pumping station, for the manner in which he has superintended all the work connected with the erection of the new engine, from the very beginning of the foundation to the last finishing touches of his new charge, besides attending to his regular duties in keeping the Leavitt engine up to the highest standard.

RE-CONSTRUCTION.

The board feeling the very urgent necessity for replacing the defective mains by new and larger ones, commenced this work early in the season. The sixteen-inch main was extended from the corner of Summer and Market, through Andrew, up Central avenue to Union, and up Union to the junction of Silsbee street. A twelve-inch main was laid through Exchange to Broad, and down Beach to Amity, and the ten-inch was extended on Broad from the foot of Union to the end of Exchange street. A six-inch main was laid through Walden street.

Realizing the very dangerous condition of the old cement pipes, this work should be prosecuted with the utmost vigor until all of them shall have been replaced with iron pipes.

NEW SUPPLY MAIN.

Our whole city, except the Highland district, is dependent for its supply of water on the sixteen-inch cement lined main which runs along the southerly side of the city. The bad condition of the cement pipes which we have taken up this year, warns us that no dependence whatever should be placed in the durability of such mains. It is, therefore, of supreme importance that a new and larger additional main should be laid down the northerly side of the city, at the earliest possible moment.

FINANCIAL.

The finances of the department are in good condition, as the following statement fully shows, and were it not that all these important additions and extensions of our works will entail very large expenditures, the board would feel justified in recommending a reduction of rates at an early day. They have the subject under consideration, and should it appear to be justifiable, looking at the large amount of construction and re-construction which remains to be done, they will so recommend to your honorable body.

RECEIPTS AND EXPENDITURES.

Water debt Dec. 20, 1890	$1,612,500 00	
Additional loans during the year 1890	185,000 00	
		$1,797,500 00
Amount of debt maturing and paid since Dec. 20, 1889		120,000 00
		$1,677,500 00
Receipts from water rates during the year	$133,069 01	
Receipts from premiums on loans	14,020 92	
Total amount of receipts credited to Water Maintenance		147,089 93
Expenditures charged to Water Maintenance		103,440 91
Net receipts carried to Sinking Funds		$43,649 02
Appropriated by City Council for Water Loan Sinking Funds, 1890		20,000 00
Total of appropriations and net receipts added to Sinking Funds during 1890		$63,649 02

CONDITION OF SINKING FUND.

Amount of Sinking Funds, Dec. 20, 1889, as per report of commissioners		$309,013 75
Amount paid to commissioners by city treasurer during year 1890, viz:		
Net income of water rates of 1889	$46,843 83	
Appropriation by City Council, 1890	20,000 00	
		66,843 83
Income from investments		11,616 71
		$387,474 29
Deduct amount of debt paid		120,000 00
Net amount in hands of commissioners		$267,474 29
Add amount of net rates for 1890 not yet paid to commissioners		43,649 02
Total Water Loan Sinking Fund in hands of commissioners and in city treasury		$311,123 31

Water debt Dec. 20, 1889	$1,612,500 00	
Additional loans during year 1890	185,000 00	
		$1,797,500 00
Amount of debt maturing and paid since Dec. 20, 1889		120,000 00
Leaving net debt now as		$1,677,500 00

STATEMENT OF WATER DEBT.

Water debt Dec. 20, 1890	$1,677,500 00
Deduct Sinking Funds	311,123 31
Net water debt	$1,366,376 69

Respectfully submitted,

DAVID KNOX,

President.

REPORT OF THE WATER REGISTRAR.

OFFICE OF THE WATER REGISTRAR,
LYNN, January 1, 1891.

To David Knox, Esq., President Public Water Board:

SIR, — I herewith present the financial condition of the department for the year ending December 31, 1890.

RECEIPTS.

Fixture rates		$102,517 46
Meter rates		24,924 87
Additional rates		3,134 02
Fines and summons		139 20

MISCELLANEOUS.

Masons' permits and other purposes	$1,292 33	
Sundry sales	274 59	
Saugus (fire purposes)	224 00	
Rent of mill	200 00	
Repairs	150 73	
Interest	50 00	
Rent of pasture	40 00	
Turning on services	10 00	
Use of seal locks	3 25	
		2,244 90
Total revenue		$132,960 45
Extra pipe and labor	$5,442 50	
Sale of wood (new basin)	2,214 94	
Deane pump	2,000 00	
Construction		9,657 44
Total receipts as per cash book		$142,617 89

COMPARATIVE STATEMENT OF REVENUE.

Amount collected during the year		$132,960 45
City appropriation		20,000 00
Amount outstanding fixture rates	$2,109 50	
Amount outstanding meter rates	488 43	
Amount outstanding meter rates, not due	6,769 78	
		9,367 71
		$162,328 16
Deduct amount due Jan. 1, 1890		7,539 89
Revenue for 1890		$154,788 27
Revenue for 1889		141,865 53
Increase		$12,922 74

STATEMENT OF NET EARNINGS FOR 1890.

Revenue		$154,788 27
EXPENSES.		
Interest	$80,183 92	
Maintenance	22,181 66	
Rebate to Saugus	1,078 45	
		103,444 03
Net earnings		$51,344 24

EXPENDITURES.

MAINTENANCE.

Pumping expenses	$7,636 29	
Salaries and office expenses	6,211 77	
Repairs on services	2,507 49	
Repairs on mains	2,455 07	
Stable and workshop	1,604 65	
Meters	616 69	
Engines and boilers	377 83	
New supply	243 62	
Birch pond	232 66	
Engine house	221 29	
Damages	74 30	
		$22,181 66

CONSTRUCTION.

Loretz pumping engine	$49,964 74	
Mains, hydrants and gates	48,450 13	
New supply	44,679 35	
New force main	16,909 70	
Services and court mains	13,176 88	
Meters	3,484 19	
New basin	2,844 41	
Breed's pond	2,457 68	
Lighting apparatus	444 55	
Removing Deane engine	501 37	
Tubular wells	528 67	
Indicator gauge	217 79	
Birch pond	63 00	
		$183,722 46
Less amount received for pipe, etc.	$5,442 50	
Less amount received for Deane pump	2,000 00	
Less amount received for wood	2,214 94	
		9,657 44
Net cost		$174,065 02

STATEMENT

SHOWING COST OF WORKS TO JANUARY 1, 1891.

Mains, hydrants and gates		$682,644 95
New supply and land		235,586 58
Services and court mains		223,774 68
New basin and land		175,855 62
Reservoir and land		131,581 49
Engines and boilers		122,769 11
Birch pond and land		87,471 84
Engine house and land		57,336 39
Breed's pond and land		55,247 78
Pipe conduit and right of way		45,293 98
Force-mains and land		41,523 70
Meters		25,049 71
Highland service		12,350 67
Tubular wells		9,374 02
Engineering		8,564 99
Workshop and stable		1,957 12
Total cost		$1,916,382 63
Less amount received for extra pipe, etc.	$77,622 63	
Less amount received for wood	3,412 44	
Less amount received for Deane pump	2,000 00	
		83,035 07
Net cost		$1,833 347 56

Following will be found the usual tables, exhibiting the number of buildings, families, stores, factories, etc., supplied with water, the class of premises to which meters are attached, the number and kinds of fixtures, the yearly revenues of the department, etc.

Respectfully submitted,

WALLACE O. MUDGE,

Water Registrar.

SERVICES.

Whole number of services	9490
Put in during the year	658
Discontinued	100
Not in use	170
Turned on (new services)	545
Turned on (re-occupied)	95
Turned on (change of ownership)	23
Turned on (rates and fine paid)	9
Shut off (for vacancy)	118
Shut off (for non-payment)	10
Services put in at Saugus 1890	44
Whole number at Saugus	292

The ratio of yearly increase in the number of services from 1876 is as follows:

1876	6.54 per cent.	1884	8.62 per cent.
1877	7.60 " "	1885	6.36 " "
1878	6.14 " "	1886	6.58 " "
1879	6.04 " "	1887	5.84 " "
1880	8.75 " "	1888	6.67 " "
1881	10.25 " "	1889	6.67 " "
1882	9.92 " "	1890	7.40 " "
1883	10.80 " "		

STATEMENT

SHOWING THE NUMBER OF BUILDINGS TO WHICH WATER IS SUPPLIED, ALSO THE NUMBER OF FAMILIES, VARIOUS FIXTURES, ETC., CONTAINED IN THE SAME, TOGETHER WITH THE NUMBER OF FIRE HYDRANTS, DEC. 31, 1890.

	LYNN.	SAUGUS.	TOTAL.
Dwellings	8,026	265	8,291
Stores	748	18	766
Factories	177		177
Offices	238	10	248
Restaurants and saloons	59		59
School-houses	37	2	39
Churches	25		25
Bakeries	30		30
Laundries	15		15
Engine-houses	5	3	8
Families	12,126	322	12,448
Boarding-houses	240		240
Faucets	20,659	538	20,997
Water-closets	5,639	76	5,715
Bath tubs	2,079	59	2,138
Hand hose	2,298	104	2,392
Urinals	228	1	229
Heaters	352	7	359
Stationary engines	133	2	135
Motors	15		15
Greenhouses	26	4	30
Drinking fountains	24		24
Standpipes, fire	15		15
Standpipes for water carts	36		36
Sewer connections	16		16
Automatic sprinklers	35	1	36
Hydrants	659	84	743

STATEMENT

SHOWING THE YEARLY REVENUE OF THE DEPARTMENT SINCE THE FIRST INTRODUCTION OF WATER INTO THE CITY IN 1871.

From October 1, 1871, to January 1, 1872	$8,989 00
From January 1, 1872, to January 1, 1873	27,568 16
From January 1, 1873, to January 1, 1874	47,992 61
From January 1, 1874, to January 1, 1875	53,545 61
From January 1, 1875, to January 1, 1876	52,553 26
From January 1, 1876, to January 1, 1877	60,867 12
From January 1, 1877, to January 1, 1878	64,002 50
From January 1, 1878, to January 1, 1879	67,570 14
From January 1, 1879, to January 1, 1880	73,949 80
From January 1, 1880, to January 1, 1881	79,635 12
From January 1, 1881, to January 1, 1882	80,967 76
From January 1, 1882, to January 1, 1883	94,419 52
From January 1, 1883, to January 1, 1884	98,893 54
From January 1, 1884, to January 1, 1885	114,903 86
From January 1, 1885, to January 1, 1886	110,089 11
From January 1, 1886, to January 1, 1887	116,375 70
From January 1, 1887, to January 1, 1888	123,507 73
From January 1, 1888, to January 1, 1889	134,480 27
From January 1, 1889, to January 1, 1890	141,865 53
From January 1, 1890, to January 1, 1891	154,788 27
	$1,706,964 61

REPORT OF THE SUPERINTENDENT.

LYNN, January 1, 1891.

To David Knox, Esq., President Public Water Board:

In compliance with the city ordinance, I herewith present the annual report of the Superintendent for the year ending Dec. 31, 1890.

WATER SUPPLY.

The present condition of our water supply is very satisfactory. The necessary work required for grading at the foot of Walden-pond dam is completed. All of the ponds are full of water, except Birch, which will be filled before it is necessary to draw from it. As at present arranged, it is possible to take the water separately from each of the four sources,—Breed's and Birch ponds both having a pipe leading directly into the well-chamber of the pumping station, while Walden pond and Hawkes brook are connected with the canal so as to be used separately or conjointly, the water passing through the canal and tunnel, thence under Birch pond in a 30″ pipe, connecting with the pipe leading to the pumping station. Thus should the water from either source become unfit for use, no damage would result to the other sources. No water was wasted from Birch or Breed's ponds, the surplus water being allowed to run from Walden pond and Hawkes brook; 371,432,241 gallons of water was taken from Birch pond, 336,146,305 gallons from Breed's and 259,757,818 gallons from the canal, making a total of 967,336,364 gallons, being 71,369,961 gallons in excess of the water pumped for 1889. This increased consumption is partly due to the extreme dry weather in the past summer, causing an unusual use of water for sprinking purposes. The amount of water taken from each source monthly can be found in Table III. An examination of the analysis of water, made by the State Board of Health each month, will show the quality of the water used.

CANAL.

The sides and bottom of the canal were thoroughly cleaned; before using, the canal and tunnel were freely flushed to render the water as pure as possible.

RESERVOIR.

While the water in the reservoir was lowered to permit laying the 30" force main, a careful examination was made of the slope walls, which were found in good condition; no repairs were needed.

FORCE MAIN.

A force main 30" in diameter, 1,806 feet in length, was laid from the pumping station to the reservoir; although for 1,337 feet it was in ledge and in close proximity to the 20" force main from the Leavitt engine, which we depended upon for our daily water supply, no damage was done, and the work was completed without accident of any kind.

PUMPING STATION.

The Leavitt engine is in good working condition; no extensive repairs have been needed. The valve-plate of the pump appears to be in the same condition as in the previous report. Should it give out, we now are supplied with an engine of sufficient capacity to ensure us an ample supply of water until the new valve-plate could be put in position. The setting of the boilers is getting bad, and should be re-set as soon as possible. The boilers have now been in use 18 years, and before the required repairs can be made, it will be necessary to put in a new battery of boilers of greater capacity, to be prepared for the increased work required in running the new engine, and to be used while the needed repairs are being made. On April 13th a coil heater was placed in the flue of the boiler to get the benefit in heating the feed-water of the escaping heat through the flue. April 22d commenced taking out the Deane steam pump and the foundation of the same. May 12th commenced putting in the foundation for the Loretz pump, which consists of brick and stone masonry, built upon a bed of concrete 20″ in thickness, covering an area 28 feet in width by 34 in length. The brick and stone masonry was laid by N. T. Davidson & Son in the most careful and thorough manner. The excavation for the foundation and laying the concrete bed was attended with several dangerous conditions, as it was necessary to excavate five feet below the wall of the building and one foot below the foundation of the Leavitt engine and the well-chamber, in gravel of a treacherous nature and filled with water. In the prosecution of the work the reservoir was filled to its highest capacity, pumping stopped and a section excavated, the concrete bed laid and allowed to set for 12 hours, then the water was permitted to rise to its normal height before the engine resumed pumping. No signs of weakness in any part of the foundation have yet appeared. June 12th commenced putting in the coffer-dam and inlet gate-chamber in the well-chamber. July 23d work was commenced in placing the Loretz engine in position. July 30th shipped the Deane pump to Kentucky. Sept. 15th made connections on boiler for the new engine. Sept. 19th put in Belknap combined motor and dynamo, with 50 incandescent lights. Dec. 17th started the new engine. The engine is what is known as a Loretz high duty duplex compound beam and fly-wheel engine, consisting of two engines each of five millions capacity in 24 hours. This type has been adopted in preference to any single engine, for should any portion of the duplex get out of order, the other remaining half can be disconnected and operated separately. The motive parts consists of four vertical cylinders, arranged in tandem pairs of 18″ and 36″ in diameter and 5½ feet stroke. The two engines are connected together by large and heavy disc cranks set at right angles to each other on a massive shaft, having a 20-foot fly-wheel, the whole weighing about 20 tons. The entire weight of engine is about 250 tons, is nearly 50 feet in height from base of central columns to top of beams, and occupies a floor space about 24 by 36 feet. There are two galleries, the first being the operating gallery where engine is started. There are four patent Loretz lift pumps. operated from the two beams, each being 22″ in diameter by 33″ stroke, and connected so as to force a continuous current through a 30″ in diameter force-tube, without noise, or jar. The work has been completed by the contractor, Arthur J. L. Loretz, in a highly satisfactory manner, and is very pleasing in appearance. Dec. 20th put in four arc lights in building.

STREET MAINS.

During the year the cement-lined pipes on Exchange, Spring, Wave, Farrar and Walden streets, Washington from Broad to Amity, Broad from Union to Exchange, Union from Broad to Exchange, were taken up and replaced with cast-iron and larger ones; the 16″ main was extended from Market, through Andrew street, Central avenue, Central square and Union street to Silsbee street; 120 services were changed from the old pipe to the new; 33,400 feet of cast-iron pipe, from 4″ to 16″ in diameter, has been laid in 55 streets; of this amount, 8,589 feet was laid to replace the cement pipe formerly used; 1,705 feet of smaller size have been laid in 7 courts, as mains; 52 gates have been set in connection with the new mains; 38 hydrants have been set; 602 services have been put in, aggregating 27,338 feet in length; 30 services have been extended, of an aggregate length of 1,537 feet; 29 services have been discontinued. In trenching for mains, 1,640 feet of ledge has been excavated; 3 new hydrants set in place of old ones; 33 hydrants have been repaired; 4 hydrants changed in location; 23 new gate-boxes set to replace old ones; 15 gates repaired; 3 gates taken out; 354 corporations have been dug up and drilled out; 210 new iron stop-boxes put in place of decayed wooden ones; 103 new meters put in; 87 meters taken out; 52 meters changed and repaired; 24 outside meter-boxes put in; 28 stop and wastes put in to replace old ones; 69 leaks on services were repaired; 154 feet of 10″ drain-pipe laid in Walnut street, at Birch brook pond.

The following tables show the work performed by the department during the year.

Respectfully submitted,

JOHN C. HASKELL,

Superintendent.

ANALYSIS OF WATER IN BREED'S POND BY STATE BOARD OF HEALTH.

DATE OF		APPEARANCE.			ODOR.		RESIDUE ON EVAPOR'TION			AMMONIA.					NITROGEN		
								Filtered.			Albuminoid.						
Collection.	Examination.	Turbidity.	Sediment.	Color.	Cold.	Hot.	Total.	Loss on Ignition.	Fixed.	Free.	Total.	In Solution.	In Suspension.	Chlorine.	As Nitrates.	As Nitrites.	Hardness.
Jan. 14	Jan. 15	Very slight	Slight.	0.4	Decided aromatic.	Faintly vegetable and mouldy.				.0002	.0148	.0140	.0008		.0070	.0001	
Feb. 12	Feb. 13	Slight.	Slight green.	0.7	Decid'ly veg. disagreeable.	Decidedly vegetable; unpleasant.				.0000	.0160	.0126	.0034		.0060	.0000	
Mar. 11	Mar. 12	Slight.	Slight.	0.45	Dist. vege'ble, disagreeable.	Very disagreeable.				.0002	.0140	.0080	.0060	.43	.0020	.0001	
April 15	April 16	Slight.	Cons. earthy and flocculent	0.3	Dist. vege'ble, disagreeable.	Distinctly vegetable; disagreeable.				.0000	.0158	.0118	.0040	.39	.0030	.0000	
May 14	May 16	Distinct.	Considerable.	0.3	Dist. vege'ble, disagreeable.	Distinctly vegetable and grassy.				.0004	.0176	.0132	.0044	.37	.0030	.0000	
June 18	June 19	Slight.	Slight.	0.4	Very faint or none.	Very faint.				.0000	.0182	.0154	.0028	.36	.0030	.0001	
July 15	July 16	Slightgreen	Slight green.	0.25	None.	None.	3.15			.0014	.0224	.0150	.0074	.42	.0000	.0000	1.27
Aug. 14	Aug. 15	Slight.	Slight.	0.35	Faintly vegetable.	Very faint or none.	3.25	1.50	1.75	.0024	.0242	.0188	.0054	.47	.0052	.0002	1.27
Sept. 10	Sept. 11	Distinct.	Slight.		None.	None.				.0004	.0244	.0174	.0070	.43	.0080	.0001	1.43
Oct. 14	Oct. 15	Very slight	Very slight.	0.4	Very faint or none.	None.	3.30	1.35	1.95	.0042	.0192	.0152	.0040	.38	.0080	.0002	0.95
Nov. 11	Nov. 11	Very slight	None.	0.6	Faintly vegetable; grassy	Distinctly vegetable and grassy.	4.40	1.95	2.45	.0054	.0214	.0194	.0020	.45	.0070	.0001	0.95
Dec. 10	Dec. 11	Very slight	Very slight.	0.5	Very faintly vegetable.	Very faintly vegetable.	3.55	1.25	2.30	.0016	.0274	.0248	.0026	.43	.0100	.0002	1.11

ANALYSIS OF WATER IN BIRCH POND BY STATE BOARD OF HEALTH.

DATE OF		APPEARANCE.			ODOR.		RESIDUE ON EVAPOR'TION			AMMONIA.					NITROGEN		
							Filtered.				Albuminoid.						
Collection.	Examination.	Turbidity.	Sediment.	Color.	Cold.	Hot.	Total.	Loss on Ignition.	Fixed.	Free.	Total.	In Solution.	In Suspension.	Chlorine.	As Nitrates.	As Nitrites.	Hardness.
Jan. 14	Jan. 15	Very slight	Very slight.	0.3	Very faint or none.	Faintly vegetable; unpleasant.				.0008	.0222	.0164	.0058		.0090	.0001	
Feb. 12	Feb. 13	Very slight	Very slight.	0.4	Very faintly vegetable.	None.				.0028	.0160	.0144	.0016		.0150	.0001	
Mar. 11	Mar. 12	Slight.	Very slight.	0.4	None.	None.				.0004	.0182	.0130	.0052	.43	.0060	.0002	
April 15	April 16	Very slight	Slight.	0.2	Faintly vegetable; peculiar.	Very faintly vegetable.				.0000	.0180	.0146	.0034	.40	.0090	.0001	
May 14	May 16	Slight.	Considerable.	0.2	Very faint or none.	Very faintly vegetable.				.0040	.0178	.0166	.0012	.42	.0080	.0001	
June 18	June 19	Distinct green.	Slight.	0.2	Faintly vegetable.	Faintly vegetable.				.0008	.0246	.0158	.0088	.40	.0020	.0001	
July 15	July 16	Slight.	Slight.	0.2	Very faintly vegetable.	Very faintly vegetable.	3.20			.0008	.0222	.0180	.0042	.44	.0000	.0001	0.95
Aug. 14	Aug. 15	Slight.	Considerable.	0.4	Faintly vegetable.	Grassy.	3.30	1.60	1.75	.0004	.0292	.0204	.0088	.42	.0000	.0002	1.11
Sept. 10	Sept. 11	Distinct.	Slight.	0.3	None.	None.				.0002	.0316	.0222	.0094	.43	.0150	.0001	1.27
Oct. 14	Oct. 15	Slight.	Slight.	0.6	Very faint or none.	None.	3.25	1.20	2.05	.0004	.0274	.0224	.0050	.38	.0071	.0001	0.95
Nov. 11	Nov. 12	Very slight	Very slight.	0.6	Faintly earthy.	Faintly vegetable.	3.80	1.30	2.50	.0922	.0204	.0182	.0022	.46	.0100	.0001	0.95
Dec. 10	Dec. 11	Slight.	Slight.	0.5	Very faintly vegetable.	Very faintly vegetable.	3.90	1.30	2.60	.0030	.0252	.0224	.0028	.42	. 025	.0001	1.11

ANALYSIS OF WATER IN GLEN LEWIS POND BY STATE BOARD OF HEALTH.

DATE OF		APPEARANCE.			ODOR.		RESIDUE ON EVAPOR'TION			AMMONIA.					NITROGEN.		
							Filtered.				Albuminoid.						
Collection.	Examination.	Turbidity.	Sediment.	Color.	Cold.	Hot.	Total.	Loss on Ignition.	Fixed.	Free.	Total.	In Solution.	In Suspension.	Chlorine.	As Nitrates.	As Nitrites.	Hardness.
Jan. 14	Jan. 15	Very slight	Slight.	0.6	Faintly vegetable.	Distinctly veg'ble so'what unpleas't	5.10	1.75	3.35	.0010	.0178	.0130	.0048	.38	.0040	.0000	0.06
Feb. 12	Feb. 13	Very slight	Very slight.	0.8	Very faint or none.	Decidedly vegetable	4.00	1.40	2.60	.0000	.0128	.0102	.0026	.36	.0050	.0000	
Mar. 11	Mar. 12	Slight.	Considerable green.	0.55	Faintly vegetable.	Strongly vege'ble and disagree'ble				.0000	.0244	.0118	.0126	.36	.0040	.0001	
April 14	April 16	Very slight	Slight reddish brown.	0.4	Distinct, peculiar.	Decidedly veg'ble and unpleasant.				.0000	.0186	.0128	.0058	.35	.0020	.0000	
May 14	May 16	Slight.	Considerable.	0.3	Distinctly vegetable.	Faintly vegetable.				.0004	.0174	.0144	.0030	.35	.0080	.0001	
June 18	June 19	Decided.	Considerable yellow-green.	0.5	Fishy.	Fishy.				.0030	.0296	.0212	.0084	.34	.0000	.0000	
July 15	July 16	Decided.	Slight yellow.	0.45	Strongly grassy	Strongly grassy.	4.45			.0076	.0758	.0296	.0462	.37	.0020	.0000	1.11
Aug. 14	Aug. 15	Slight.	Considerable.	1.2	Distinctly grassy.	Strongly grassy and vegetable.	5.35	3.15	2.20	.0632	.0624	.0554	.0070	.38	.0050	.0003	1.11
" 25	" 26	Distinct.	C'nsid'ble reddish floccul'nt	1.1	Distinctly grassy.	Distinctly vegetable, grassy.				.0632	.0902	.0746	.0156	.36	.0150	.0002	
" "	" "	Distinct.	Slight.	1.0	Distinctly grassy.	Distinctly disagreeable.				.0720	.0694	.0584	.0110		.0070	.0001	
Sept. 10	Sept. 11	Distinct.	Slight.	1.0	Vegetable, disagreeable.	Strongly vegetable.				.1390	.0636	.0558	.0078	.40	.0130	.0002	1.43
Oct. 14	Oct. 15	Slight.	Slight.	1.2	Faintly vegetable.	Mouldy and disagreeable.	5.65	3.00	2.65	.1112	.0704	.0568	.0136	.31	.0080	.0005	1.11
Nov. 11	Nov. 12	Very slight	Very slight.	1.4	Faintly earthy.	Distinctly vegetable; peculiar.	4.80	2.15	2.65	.0740	.0438	.0388	.0050	.40	.0080	.0003	0.79
Dec. 10	Dec. 11	Slight.	Considerable.	0.75	Dist'ly veg'ble and unpleas'nt	Decidedly veg'ble very disagreeable.	4.90	2.10	2.80	.0954	.0836	.0630	.0206	.33	.0120	.0002	0.95

ANALYSIS OF WATER IN WALDEN POND BY STATE BOARD OF HEALTH.

DATE OF		APPEARANCE.			ODOR.		RESIDUE ON EVAPOR'TION			AMMONIA.					NITROGEN		
											Albuminoid.						
Collection.	Examination.	Turbidity.	Sediment.	Color.	Cold.	Hot.	Total.	Loss on Ignition.	Fixed.	Free.	Total.	In Solution.	In Suspension.	Chlorine.	As Nitrates.	As Nitrites.	Hardness.
Jan. 14	Jan. 15	Very slight	Very slight.	1.0	Faintly vegetable.	Distinctly vegetable.	4.25	2.20	2.05	.0012	.0194	.0178	.0016	.36	.0040	.0000	0.8
Feb. 12	Feb. 13	Slight.	Considerable flocculent.	1.2	Faintly vegetable.	Decidedly vegetable.	4.30	2.10	2.20	.0000	.0246	.0170	.0076	.36	.0060	.0000	
Mar. 11	Mar. 12	Slight.	Slight green.	0.9	Very faintly vegetable.	Distinctly vegetable.				.0002	.0262	.0182	.0080	.34	.0040	.0001	
April 14	April 16	Slight.	Considerable flocculent.	0.45		Faintly vegetable.				.0004	.0206	.0156	.0050	.32	.0040	.0000	
May 14	May 16	Slight.	Slight.	0.8	Dist. vege'ble, unpleasant.	Distinctly vegetable.				.0022	.0196	.0164	.0032	.34	.0070	.0000	
June 18	June 19	Slight.	Slight.	0.9	Vegetable.	Distinctly vegetable.				.0094	.0258	.0234	.0024	.32	.0000	.0001	
July 15	July 16	Slight.	Very slight.	0.8	Vegetable.	Vegetable and mouldy.				.0110	.0382	.0346	.0036	.34	.0000	.0000	1.27
Aug. 14	Aug. 15	Slight.	Considerable.	1.1	Very disagreeable.	Slightly pungent.	5.20			.0644	.0610	.0494	.0116	.35	.0050	.0002	0.95
" 25	" 26	Distinct.	Considerable bright green.	1.3	Vegetable.	Very disagreeable; fishy.				.0576	.0746	.0560	.0186	.35	.0080	.0002	
" "	" "	Distinct.	Slight yellow.	1.2	Faintly grassy.	Distinctly vegetable, mouldy, fishy				.0640	.0634	.0532	.0102		.0080	.0002	
Sept. 16	Sept. 17	Slight.	Considerable bright green.	1.3	None.	Vegetable.				.0126	.0766	.0562	.0204	.26	.0020	.0003	
Oct. 14	Oct. 15	Very slight	Slight.	1.4	Very faintly vegetable.	Mouldy and disagreeable.	5.70	3.25	2.45	.0526	.0552	.0498	.0054	.33	.0080	.0002	1.27
Nov. 11	Nov. 12	Very slight	Very slight.	1.6	Faintly earthy.	Distinctly vegetable; peculiar.	5.55	2.90	2.65	.0940	.0642	.0540	.0102	41	.0070	.0003	1.11
Dec. 10	Dec. 11	Very slight	Very slight.	0.2	Faintly vegetable.	Distinctly vegetable.	5.5	3.00	2.50	.0718	.0610	.0498	.0112	.36	.0200	.0001	0.95

SUMMARY OF STATISTICS

REPORT OF 1890.

IN ACCORDANCE WITH SUGGESTIONS ADOPTED BY THE NEW ENGLAND WATER WORKS ASSOCIATION.

LYNN WATER WORKS, LYNN, MASS.

Population by census of 1890	55,727
Date of construction	1870 to 1872
Owned by the City of Lynn.	
Source of Supply: — Four artificial storage basins, formed by damming four brooks, and the water of one other brook in North Saugus taken direct.	
Mode of Supply: — By gravitation to the pump-well, and pumped thence to distributing reservoir at an elevation of 177 feet above mean high tide, by one Leavitt engine, built by I. P. Morris & Co., of Philadelphia, of 5,000,000 gallons daily capacity, and one Loretz engine of 10,000,000 gallons daily capacity.	
Kind of coal used, George's Creek, Cumberland.	
Cost of coal, $4.75 per net ton delivered (2,000 lbs.)	
Coal consumed for the year in pounds, for all purposes	1,236.165
Total pumping in gallons	967.336,364
Average head, including friction in feet	172.44
Number of gallons pumped per pound of coal	782
Duty on total coal consumed, no deductions	116,930,878
Cost of pumping (figured on pumping station expenses, viz: $7,406.59) per million gallons into the reservoir	$7.646
Per million gallons one foot high	$0.044

FINANCIAL.

Receipts —	For water for all purposes	$152,092 68
	Summons, shutting off and letting on	149 20
	Rent and sundries	718 57
	Total revenue	$152,960 45
	Labor and material	7,442 50
	Sale of wood	2,214 94
	Total receipts	$162,617 89

Expenditures —	Management and repairs	$22.107 36
	Interest on bonds	81,262 37
	Damages	74 30
	Total	$103,444 03
	Carried to credit of construction	9,657 44
	Carried to sinking fund	49,516 42
		$162,617 89

CONSUMPTION.

Estimated population to date, Lynn and Saugus	59,400
Estimated population supplied	56,430
Total number of gallons consumed for the year	969,692,037
Total number of gallons metered	124,620,000
Average daily consumption in gallons	2,656,690
Gallons per day to each consumer	47.08

DISTRIBUTION.

Kind of pipe used, wrought-iron, cement-lined, and cast-iron.

Size, from 4″ to 16″ diameter.

Extended	4 m. 3,691 ft.
Total now in use	91 m. 5,059 ft.
Number of leaks for the year	136
Hydrants added	38
Hydrants now in use	658
Gates added	52
Gates taken out	3
Gates now in use	801
Range of pressure at center of city for day and night	54 to 65 lbs.

SERVICES.

Kind of pipe used, iron cement-lined, adamanta and galvanized iron.

Size of pipe used ¾″ to 10″ diameter.

Extended	27,338 ft. 6 in.
Total now in use	72 m. 474 ft. 6 in.
Number of services added	602
Number of services discontinued	29
Number of services now in use	9,178
Meters added	16
Meters now in use	340

TABLE I.

RECORD OF THE LEAVITT ENGINE FOR THE YEAR ENDING DECEMBER 31, 1890.

DATE.	Number of pumping days.	Total pumping time per month.	Average pumping time per day.	Number of revolutions per month.	Average revolutions per minute.	COAL CONSUMED.				Ashes.	Ashes.	Gallons pumped per month allowing 4 per cent. for loss of action in pump.	Average number of gals. pumped per lb. of coal.	Average number of gallons raised 100 feet high per lb. of coal.	Average head against the pump.	Average duty in lbs. of water raised one foot high per 100 lbs. of coal, no deduction for ashes.	Average duty in lbs. of water raised one foot high per 100 lbs. of coal, the ashes deducted.	Oil.	Waste.
						Raising Steam.	Pumping.	Banking.	Total.										
Month.	Days	H. M.	H. M.	Rev.	Rev.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Perct.	Gallons.	Galls.	Gals.	Feet.	Lbs.	Lbs.	Galls.	Lbs.
January . .	27	346.05	12.49	380,900	18.33	7,600	79,250	4,800	91,650	8,570	9.35	71,056,895	775	1,337.67	172.60	116,194,478	128,087,851	12 5.	9
February .	24	320.35	13.39	357,000	18.55	6,800	78,165	4,150	89,115	9,170	10.29	66,598,350	747	1,291.24	172.85	112,166,527	125,032,460	12	9
March . .	26	353.35	13.36	393,600	18.55	7,100	82,850	4,200	94,150	8,785	9.33	73,426,080	779.8	1,346.84	172.71	116,958,629	128,994,962	12	9
April . . .	25	342.15	13.41	378,400	18.42	6,700	78,800	4,000	89,500	8,950	10.00	70,590,520	788	1,360.84	172.69	118,268,070	131,408,965	12	12
May . . .	21	356.30	16.59	385,300	18.00	4,200	85,700	1,600	91,500	10,750	11.75	71,877,715	785	1,353.98	172.37	117,571,831	133,223,809	12	15
June . . .	20	419.45	20.59	454,900	18.06	3,300	102,900	1,600	107,800	11,525	10.68	84,861,595	787	1,356.20	172.32	117,789,376	131,889,846	12	10
July . . .	26	516.05	19.50	558,800	18 08	2,900	126,700	1,600	131,200	14,860	11.32	104,244,140	794	1,370.28	172.58	119,061,520	134,269,137	12	14
August . .	26	451.30	17.21	490,800	18.11	4,600	108,650	2,800	116,050	13,980	12.04	91,558,739	788	1,361.02	172.31	118,319,660	134,525,292	12	13
September	24	402.20	16.45	436,500	18.08	5,700	95,850	2,200	103,750	10,540	10.15	81,429,074	784	1,350.31	172.23	117,374,070	130,646,495	12	12
October .	27	419.30	15.32	455,000	18.06	5,500	100,450	3,400	109,350	11,091	10.14	84,880,249	776	1,335.45	172.09	115,989,588	129,081,931	12	12
November	23	393.25	17.06	427,400	18.10	3,400	95,500	2,200	101,100	10,200	10.08	79,731,468	788	1,356.10	172.09	117,844,619	131,068,108	12	12
December	24	440.30	18.21	466,800	17.66	3,900	105,300	1,800	111,100	12,225	11.00	87,081,539	784	1,341.38	172.09	117,228,785	131,737,739	12	12
Totals and averages.	289	4,762.05	16.28	5,185,400	18.15	61,700	1,140,115	34,350	1,236,165	130,064	10.56	967,336,364	782	1,348.48	172.44	116,930,878	130,743,367	143 5	139

TABLE I.—CONTINUED.

COST OF PUMPING WITH THE LEAVITT ENGINE FOR THE YEAR 1890.

1,236,165 pounds of coal at $4.75 per net ton (2,000)	$2,935 88
Repairs on engine and boilers	377 83
Oil, packing, waste, etc.	204 82
Sundry small stores	125 00
Insurance	41 66
Wages of Engineers and Firemen	3.721 40
	$7.406 59

Cost of raising one million gallons into the reservoir	$7 64.6
Cost of raising one million gallons one foot high	0 04.43

TABLE II.

SHOWING THE CONSUMPTION OF WATER FOR THE YEAR ENDING DECEMBER 31, 1890.

	Monthly consumption.	Average consumption per day.	Average daily increase.	Average daily decrease.	Average to each consumer.	Average to each inhabitant.
Month.	Gallons.	Gallons.	Gallons.	Gallons.	Galls.	Galls.
January .	71,379,179	2,302,554		237,801	40.80	38.76
February .	66,598,350	2,378,512	75,958		42.15	40.04
March . .	73,426,080	2,368,563		9,949	41 97	39.87
April . .	70,848,364	2,361,612		6,951	41.85	39.75
May . . .	76,055,983	2,453,419	91,807		43.47	41.30
June . .	82,555,423	2,751,847	298,428		48.76	46.32
July . . .	103,200,269	3,329,041	577,194		58.99	56.04
August . .	92,691,806	2,990,058		338,983	52.98	50.34
September.	82,181,647	2,739,388		250,670	48.54	46.12
October .	83,179,922	2,683,223		56,165	47.54	45.17
November .	78,518,259	2,532,847		150,376	44.88	42.64
December .	89,056,755	2,872,798	339,951		50.90	48.36
Totals and Averages.	969,692,037	2,656,690			47.08	44.72

TABLE III.

AMOUNT OF WATER USED FROM EACH SOURCE DURING THE YEAR 1890.

	Breed's.	Birch.	Canal.	Total.
Month.	Gallons.	Gallons.	Gallons.	Gallons.
January . .	44,250,904	24,281,348	2,524,643	71,056,895
February .	30,278,618	2,481,115	33,838,617	66,598,350
March . .	39,509,425	31,666,862	2,249,793	73,426,080
April . . .	46,195,375	16,369,762	8,025,383	70,590,520
May . . .	30,085,850	10,055,045	31,736,820	71,877,715
June . . .	49,566,335	23,374,715	11,920,545	84,861,595
July . . .		104,244,140		104,244,140
August . .	64,844,779	26,713,960		91,558,739
September .		81,429,074		81,429,074
October . .		50,816,220	34,064,029	84,880,249
November .			79,731,468	79,731,468
December .	31,415,019		55,666,520	87,081,539
Total . . .	336,146,305	371,432,241	259,757,818	967,336,364

TABLE IV.

SHOWING THE RAINFALL AT THE PUMPING STATION FOR 1890.

Day of month.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1.	.....	.....	0.33	.....	.....	.....	.....	.....	.....	.....	.....	.....
2.	.....	0.12	0.84	.....	.....	.....	0.02	.....	.....	.....	.....	.....
3.	.....	.....	0.04	0.01	....	0.43	0.01	.....	.....	1.02	.....	1.15
4.	0.18	0.15	.....	0.20	1.15	0.40	0.07	.....	.....	0.15	.....	.....
5.	0.23	.....	0.17	.....	.....	0.22	.....	.....	.....	.....	.....	0.15
6.	.....	.....	0.39	.....	1.15	0.48	.....	0.55	1 22	0.17	.....	0.23
7.	.....	0.11	.....	0.37	.....	.....	0.01	.....	.....	0.43	.....	.....
8.	.....	0.72	.....	0.41	0.45	.....	.....	.....	.....	.....	.....	.....
9.	0.07	.....	.....	0 55	.....	.....	.....	0.25	0.14	.....	.....	.....
10.	0.12	0.03	.....	.....	0.24	.....	.....	0.22	0.15	0.08	.....	.....
11.	0.22	.....	0.10	.....	.....	0.04	.....	.....	0.82	.....	0.03	.....
12.	0.03	.....	0.01	.....	.....	0.63	.....	.....	1.05	.....	0 02	.....
13.	.....	.....	0.05	.....	0.06	0.85	.....	.....	0.06	.....	.....	.....
14.	.....	0.42	0.96	0.03	0.28	.....	.....	.....	0.05	0.31	.....	.....
15.	0.47	.....	0.54	.....	0.42	.....	.....	.....	0.94	.....	0 26	.....
16.	0.20	.....	.....	.....	0.08	.....	.....	.....	0.84	1.03	.....	.....
17.	.....	0.30	.....	.....	.....	.....	0.03	0.50	0.12	0.25	1.03	2.05
18.	.....	0.12	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.08
19.	.....	0 64	0.75	.....	.....	.....	0.23	0.87	.....	1.75	.....	.....
20.	0.04	0.27	0 01	.....	0.45	.....	0.02	0.05	.....	0 02	.....	.....
21.	0 01	.....	0.04	.....	.....	.....	.....	0.12	.....	.....	.....	0.03
22.	.....	.....	1.75	.....	.....	.....	.....	.....	.....	.....	.....	.....
23.	0.09	0.02	0 04	.....	.....	.....	.....	0.67	.....	0.15	.....	.....
24.	.....	0.02	.....	0 03	.....	0.11	0.36	.....	.....	1.69	.....	.....
25.	.....	1.31	0.38	0.08	.....	.....	0.11	.....	.....	.....	.....	.....
26.	0.42	.....	.....	0.81	0.62	0.01	0.64	1.10	0 29	.....	.....	1.70
27.	0.14	0.01	0.12	0.10	0.98	.....	0.28	0.03	.....	.....	.....	.....
28.	.....	0.45	0 88	.....	0.11	.....	.....	.....	.....	.....	.....	.....
29.	0.21	.....	0.05	.....	.....	.....	.....	.....	.....	0.31	.....	.....
30.	0.03	.....	.....	.....	.....	.....	.....	0.26	.....	.....	.....	.....
31.	0 05	.....	0.11	.....	.....	.....	0.21	.....	.....	.....	.....	.....
	2.51	4.69	7.56	2.59	5.99	3.17	1.99	4.62	5.68	7.36	1.34	5.39

Rainfall for the year, 52.89.

TABLE V.

SHOWING THE DEPTH OF WATER IN THE PONDS FOR EACH WEEK DURING 1890.

Date.	Breed's Pond.		Birch Pond.		Walden Pond.		Glen Lewis Pond.		Date.	Breed's Pond.		Birch Pond.		Walden Pond.		Glen Lewis Pond.		Date.	Breed's Pond.		Birch Pond.		Walden Pond.		Glen Lewis Pond.	
	Ft.	In.	Ft.	In.	Ft.	In.	Ft.	In.		Ft.	In.	Ft.	In.	Ft.	In.	Ft.	In.		Ft.	In.	Ft.	In.	Ft.	In.	Ft.	In.
Jan. 1	19	3½	20	9½					May 7	20	7	22	3	16	8	17	3	Sept. 1	15	10½	15	7	15	10½	17	
" 7	19	2	20	10					" 14	20	9½	22	5½	17	2	17	3½	" 8	15	9	15	11	15	10½	17	1
" 13	19	5	20	6½					" 21	20	11	22	7	17	2	17	3	" 15	15	11	14	5½	16	½	17	1½
" 20	19	1½	20	9	8	10	13	10	" 28	21		22	5	17	2	17	3	" 22	16	5	13	7	16	½	17	2
" 27	18	3¼	20	9½	9	8½	14	4	June 2	20	10½	22	5½	17	2	17	3	" 29	16	5½	12	10	16		17	2
Feb. 5	18	6½	20	4½					" 9	20	5½	22	6½	17	2	17	3	Oct. 6	16	6½	12		16	6	15	2
" 12	18	5	20	6	10		14	11	" 16	20	6½	22	8½	17	2	17	3	" 13	16	7½	11	2	16	5½	15	4
" 20	18	5½	20	9	10	7	15	5	" 23	19	6½	22	7½	17	1½	17	2	" 20	17	4½	10	11½	17	2	16	9
" 28	19		21	1	11	3	16	5½	" 30	19	5½	21	10	17	1	17	1½	" 27	18	8	11	8	17	5	17	2
Mar. 5	19	4¼	21	3	11	6½	16	9	July 7	19	5½	20	11	17		17		Nov. 3	19	4½	12	½	17	3	17	1½
" 12	19	11	20	8	12	3	17		" 14	19	3½	19	6	16	7½	16	11	" 10	19	5	12	4½	17	1½	17	1½
" 19	20	11½	21	½	13	4½	17	5	" 21	19	2½	18	8	16	7	16	11	" 17	19	6½	12	10	17	2	17	1½
" 26	21	2	21	9	15	2	17	5	" 28	19	3	17	8	16	7	17		" 24	19	10½	13	1	17		17	1½
Apr. 2	21		22	2½	16		17	5	Aug. 4	19	2½	16	10½	16	7	17		Dec. 1	19	11	13	3	16	7	17	1½
" 9	21		22	1½	16	1½	17	5	" 11	17	9	16	10	16	5½	17		" 8	20		13	7½	16	9½	17	3½
" 16	20	9½	21	11	16	2½	17	3	" 18	16	10	16	8	16	1½	17		" 15	19	10½	13	8	16	10	17	4
" 23	20	2	21	11	16	3	17	2	" 25	15	10½	16	4	16		17		" 22	20	4	14	7½	16	9	17	4
" 30	20	1	22	1½	16	6	17	2½										" 29	19	7½	15	2½	16	6	17	4

TABLE VI.

SHOWING THE AMOUNT AND SIZE OF PIPE LAID IN 1890.

STREETS WHERE LAID.			Kind of Pipe.	SIZE OF PIPE.					
Street.	From.	To.		16 in.	12 in.	10 in.	8 in.	6 in.	4 in.
Andrew . . .	Market . . .	Central av . .	C. I.	*624					
Arbor	Harvest . . .	End of street.	"					551	
Bacheller's ct.	Cottage . . .	" " "	"						434
Bailey	Lynnfield . .	" " "	"						625
Beacon Hill av	Bay View av.		"					516	
Broad	Union	Exchange . .	"			*1,243	*8	*20	
Burrill av . .	Ingalls av . .	End of street.	"					54	563
Box pl	Broad	" " "	"					582	187
Caldwell . . .	Extension . .	" " "	"						369
Central av . .	Andrew . . .	Central sq . .	"	*775					
" sq . .	Union	" av . .	"	*282			*54		
Coburn . . .	Extension . .	End of street.	"					194	
Eastern av . .	Pacific		"			1,024		18	
" " . .	Ocean		"			998		19	
Elmwood av .	West Neptune	End of street.	"						747
Ellsmere pl .	Extension . .	" " "	"						374
Exchange . .	Union	Broad	"	*722				*63	
Farrar	Newhall . . .	"	"					*687	
Gas House rd	Alley		"						729
Gertrude . . .	Lexington . .	President . .	"					413	
Grant	Extension . .		"				160		
"	Carleton . . .	Rockingham.	"				247	40	
Harrison . .	Walnut . . .	Reservoir road	"					926	10
Houghton . .	Orchard . . .	Houghton ct.	"						436
Lexington . .	Extension . .		"					40	
Light st ct . .	Light	End of court.	"						272
Linwood av .	Grove	Moulton . . .	"					672	
Lynnfield . .	Extension . .		"					1,468	19
Mansfield . .	Hudson . . .		"						375
Market . . .	Summer . . .	Andrew . . .	"	*36					
Milton	Oakwood av .	End of street.	"						397
Morton . . .	Arbor		"						102
Moulton . . .	Winter . . .	Linwood av .	"					608	
Nahant . . .	Extension . .		"						275
Norton	" . .		"						164
Orchard . . .	End of pipe.	West Neptune	"					323	
Pacific	Extension . .	End of street.	"						518
Park av . . .	Walnut . . .		"					283	
Perkins . . .	Harrison . . .	Harrison. . .	"						787
President . .	Oakwood av .		"					558	8
" . .	Gertrude . . .	Western av .	"					636	
Salem	Cedar	Moulton . . .	"						270
Sigourney .	Walnut . . .	End of street.	"					658	8
Spring	Exchange . .	Broad	"		*437				
Stiles	Perkins . . .	Reservoir road	"						590
Superior . . .	Michigan av .	Eastern av . .	"					451	44
Union	Broad	Exchange . .	"			*892			
"	Central av . .	Silsbee	"	*535			*88	*96	
Walden . . .	Summer . . .	Western av .	"						*528
Walnut . . .	Belmont av .	Sigourney . .	"					1,977	25
Washington .	Union	Broad	"			439			
" .	Amity	"	"		*582	*382		*24	
Warren . . .	End of pipe .	Elm	"						195
Wave	Ocean		"						*511
West Neptune			"						728
Totals				2,974	1,019	4,978	557	11,877	10,290

* Re-laid.

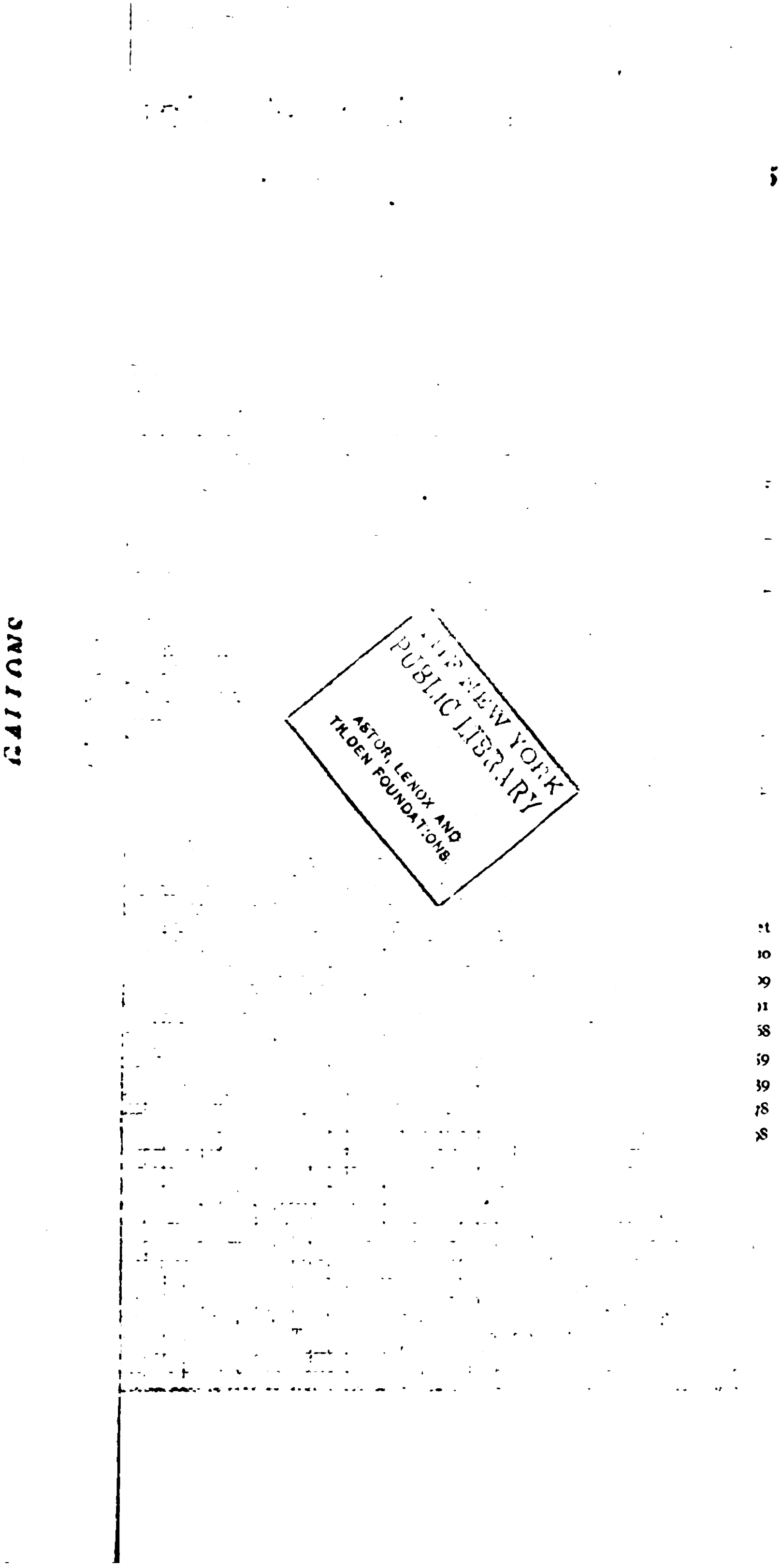

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TABLE VI.—CONTINUED.

SHOWING THE AMOUNT AND SIZE OF PIPE LAID IN 1890.

COURTS WHERE LAID.			Kind of Pipe.	SIZE OF PIPE	
Court.	From.	To.		2 in.	1½ in.
Ainsworth pl. . .	Bacheller ct . . .	End of place. . .	C. L.	182	
Graves pl	Maple	" " " . .	"	262	
Holton ct	No. Common. . .	" " court. . .	"	359	
Hone pl	Western av . . .	" " place. . .	"	286	19
Mildred	Summer	" " street. . .	"	259	
N. Franklin ct . .	No. Franklin. . .	Extension	"		51
Thurston pl . . .	Essex	End of place. . .	"	287	
Totals				1,635	70

	Miles.	Feet
Total pipe laid in 1890	4	1720
Cement pipe taken up and replaced with cast iron	1	3309
Total extension	4	3691
Previously laid.	87	1368
Laid to January 1, 1890	91	5059
Laid in Saugus	9	1539
Private pipe in Swampscott		1778
Total supplied by the works	101	3098

TABLE VII.

SHOWING THE LOCATION OF GATES SET IN 1890.

STREET.	LOCATION.
Ainsworth place	6 ft. 6 in. N. of N. line Bacheller court; 11 ft. W. of E. line of Ainsworth place.
Andrew	6 ft. E. of W. line Central avenue; 17 ft. S. of N. line of Andrew street.
Andrew	On E. line Market street; 17 ft. 8 in. S. of N. line of Andrew street.
Arbor	On N. line Harvest street; 10 ft. W. of E. line of Arbor street.
Bacheller's court	On W. line Cottage street; 17 ft. S. of N. line of Bacheller's court.
Bailey	On W. line Lynnfield street; 18 ft. S. of N. line of Bailey street.
Beacon Hill ave.	On W. line Bay View avenue; 10 ft. 6 in. W. of E. line of Beacon Hill avenue.
Box place	On S. line Broad street; 20 ft. 8 in. E. of W. line of Box place.
Broad	11 ft. 6 in. W. of W. line No. 168 Broad street; 16 ft. 6 in. N. of S. line of Broad street.
Broad	6 in. W. of W. line Washington street; 21 ft. N. of S. line of Broad street.
Burrill avenue	On S. line Ingalls avenue; 16 ft. W. of E. side of Burrill avenue.
Central avenue	On N. line Munroe street; 14 ft. W. of E. line of Central avenue.
Central square	On E. line Central avenue; 59 ft. S. of N. line of Union street.
Eastern avenue	On S. line Pacific street; 22 ft. W. of E. line of Eastern avenue.
Eastern avenue	On N. line New Ocean street; 17 ft. W. of E. line of Eastern avenue
Elmwood avenue	On S. line Neptune street; 17 ft. W. of E. line of Elmwood avenue.
Exchange	On N. line Broad street.
Exchange	On line S. side Earl's block; 49 ft. S. of S. side of E. R. R.
Gas-house road	8 ft. E. of W. side Court; 5 ft. 6 in. N. of S. line of Alley street.
Gertrude	On N. line Lexington street; 18 ft. W. of E. line of Gertrude street.

TABLE VII.—CONTINUED.

SHOWING THE LOCATION OF GATES SET IN 1890.

STREET.	LOCATION.
Grant	On N. line Grant street; 15 W. of E. line of Carleton street.
Grant	On N. line Grant street; 23 ft. W. of E. line of Rockingham street.
Graves place . .	On S. line Maple street; 10 ft. W. of E. line of Graves place.
Harrison . . .	On N. line Walnut street; 17 ft. E. of W. line of Harrison street.
Holton court . .	On N. line North Common street; 9 ft. 6 in. W. of E. line of Holton court.
Houghton . . .	On W. line Orchard street; 17 ft. S. of N. line of Houghton street.
Hone place . .	9 ft. N. of N. line Western avenue; 12 ft. E. of W. line of Hone place.
Light-st. court .	On E. line of Light street; 6 ft. 6 in. S. of N. line of Light-street court.
Linwood avenue	On W. line Grove street; 14 ft. N. of S. line of Linwood avenue.
Lynnfield . . .	13 ft. W. of E. line Lynnfield street; 10 ft. N. of hydrant at upper end of Sluice pond.
Milton	On S. line Oakwood avenue; 23 ft. W. of E. line of Milton street.
Mildred	On S. line Summer street; 17 ft. W. of E. line of Mildred street.
Moulton . . .	On N. line Winter street; 16 ft. 6 in. E. of W. line of Moulton street.
Orchard	9 ft. N. of N. line West Neptune street; 16 ft. W. of E. line of Orchard street.
Oxford	On N. line Central avenue; 17 ft. W. of E. line of Oxford street.
Oxford	7 ft. S. of S. line Central avenue; 16 ft. W. of E. line Oxford street.
Pacific	12 ft. E. of hydrant; 17 ft. S. of N. line of Pacific street.
Park avenue . .	On N. line Walnut street; 17 ft. E. of W. line of Park avenue.
Perkins	On W. line Harrison street; 17 ft. S. of N. line of Perkins street.

TABLE VII.—CONTINUED.

SHOWING THE LOCATION OF GATES SET IN 1890.

STREET.	LOCATION.
Perkins	On W. line Harrison street; 17 ft. S. of N. line of Perkins street.
President . . .	On N. line Oakwood avenue; 15 ft. W. of E. line of President street.
Salem	On W. line Cedar street; 16 ft. S. of N. line of Salem street.
Sigourney . . .	On W. line Walnut street; 17 ft. S. of N. line of Sigourney street.
Spring	On S. line Exchange street; 23 ft. 8 in. E. of W. line of Spring street.
Thurston place .	On N. line Essex street; 9 ft. 4 in. W. of E. line of Thurston place.
Union	4 ft. N. of N. line Fuller's block; 14 ft. S. of N. line of Union street.
Walnut	On W. line Park avenue; 17 ft. S. of N. line of Walnut street.
Warren	On E. line of Elm street; 14 ft. S. of N. line of Warren street.
Washington . .	On N. line Broad street; 16 ft. E. of W. line of Washington street.
Washington . .	On S. line Union street; 16 ft. E. of W. line of Washington street.
Wave	On S. line Ocean street; 18 ft. W. of E. line of Wave street.

TABLE VIII.

SHOWING THE LOCATION OF HYDRANTS SET IN 1890.

STREET.	LOCATION.
Arbor	345 feet from Harvest street
Bailey	354 feet from Lynnfield street
Box place	272 feet from Broad street
Caldwell	381 feet from Norton street
Centre	opposite office T.-H. E. Co. (private)
Eastern avenue	9 feet from New Ocean street
Eastern avenue	468 feet from New Ocean street
Eastern avenue	359 feet from Pacific street
Eastern avenue	10 feet from Woodland avenue
Elmwood avenue	416 feet from West Neptune street
Elsmere place	654 feet from Lewis street
Eederal	at engine-house
Federal	473 feet from Marion street
Gertrude	15 feet from President street
Grant	251 feet from Carleton street
Green	314 feet from Howard street
Harrison	10 feet from Perkins street
Ingalls avenue	corner Ingalls and Burrill avenues
Linwood avenue	612 feet from Grove street
Lynnfield	opposite No. 285
Lynnfield	150 feet from No. 252
Mansfield	358 feet from Hudson street
Market square	Market square, corner Western avenue
Milton	347 feet from Oakwood avenue
Norton	250 feet from Light street
Pacific	94 feet from No. 84
Perkins	137 feet from Harrison street
President	14 feet from Western avenue
President	478 feet from Oakwood avenue
Sigourney	592 feet from Walnut street
Superior	10 feet from Eastern avenue
Suffolk	opposite Suffolk court
Walnut	550 feet from Belmont street
Walnut	227 feet from Harrison street
Walnut	1,174 feet from Belmont street
Walnut	4 feet from corner Sigourney street
Wave	387 feet from Ocean street
West Neptune	6 feet from Elmwood avenue

TABLE IX.

SHOWING THE NUMBER, SIZE AND LENGTH OF SERVICES LAID IN 1890.

MONTH.	SIZE AND LENGTH OF PIPE.																		TOTAL.	
	10 in.		8 in.		6 in.		4 in.		2 in.		1½ in.		1¼ in.		1 in.		¾ in.			
	No.	Feet.	No.	Feet.	No.	Feet.	No.	Feet.	No.	Feet.	No.	Feet.	No.	Feet.	No	Feet.	No.	Feet.	No.	Feet.
Jan . .									1	21.3			1	30.8	7	192.9	3	96.10	12	341.6
Feb . .													2	117.5			2	48.8	4	166.1
March .							2	*39.4							3	139.2	9	319.11	14	537.5
April .															19	1,178.4	25	878.4	44	2,056.8
May . .							1	41	2	56.9	1	32.10	1	36	20	1,043.11	24	888.7	49	2,099.1
June. .							1	*34	1	25.4	1	24.2	2	106.4	32	1,809.1	27	1,137	64	3,135 11
July . .							4	*346.6					3	93.8	34	1,820.10	35	1,327.9	76	3,588.9
August							2	*171.4					2	44	29	1,422.7	40	1,494.7	73	3,132.6
Sept. .	1	52		*94.6	1	*819.3	4	*158.8					6	193 6	19	877.10	19	636.11	50	2,822.8
October							2	*186	3	375.6	1	25.7	4	121.11	22	1,136.2	36	1,216.1	68	3,061.3
Nov . .			1	87			1	*187	2	120.6			5	422.8	32	1,576.2	53	1,951.	94	4,344.4
Dec . .													1	102.4	19	738.11	34	1,201.1	54	2,042.4
Totals	1	52	1	181.6	1	819.3	17	1,202.10	9	599.4	3	82.7	27	1,268.6	236	11,935.8	307	11,196.9	602	27,338.6

* Fire Sprinklers.

TABLE X.

SHOWING THE LEAKS IN PIPES AND HYDRANTS, 1890.

MONTH.	SIZE OF MAINS.						Hydrants.
	16 in.	12 in.	10 in.	8 in.	6 in.	4 in.	
January			1	3	8	5	
February			1		4	3	2
March			1		1		1
April			2		3	3	2
May			1	3	5	7	1
June				1	6	4	
July			1	2	8	12	1
August			1	1	6	5	
September					1	2	1
October	1		1	1	3	14	1
November					3	5	10
December		1		1	3	2	18
Totals	1	1	9	12	51	62	37

TABLE XI.

SHOWING THE KIND, SIZE AND NUMBER OF METERS IN USE IN 1890.

KIND.	4	3	2	1½	1	¾	⅝	½	Total.
Worthington . .		1	13	6	60	43	31		154
Ball & Fitts . .					20	44	22		86
Union . . .	6		2	4	6	10	9		37
Thomson . .	1				11	7	4		23
Crown . . .				3	2	8		1	14
Duplex . . .					6	2	1		9
Niagara . . .					4				4
Weir . . .					2	1		1	4
Gem . . .			1			1		1	3
Parker Wells . .						1			1
Empire . . .						1			1
Hersey . . .						1			1
Frost . . .						1			1
Motors . . .									2
Totals . . .	7	1	16	13	111	120	67	3	340

Total gallons metered, 124,620,000.

Meteorological Record for January, 1890.

	8 A. M.		1 P. M.		6 P. M.		24 HOURS ENDING 8 A. M.				
Date.	Barometer.	Thermometer.	Barometer.	Thermometer.	Barometer.	Thermometer.	Maximum Thermometer.	Minimum Thermometer.	Daily Range.	Daily Mean.	Rainfall.
1	30.86	34.0°	30.77	42.0°	30.70	43.0°	50.0°	34.0°	16.0°	42.00°	-
2	30.42	49.0	30.23	63.0	30.13	60.0	63.0	38.5	24.5	50.75	-
3	30.35	38.5	30.43	42.0	30.46	35.0	42.0	23.5	18.5	32.75	-
4	30.60	23.5	30.57	32.5	30.43	32.5	39.0	24.0	15.0	31.50	0.37
5	30.30	38.5	30.01	43.5	30.0	36.5	46.5	34.0	12.5	40.25	-
6	29.83	34.0	29.72	40.5	29.64	53.5	56.5	34.0	22.5	45.25	-
7	29.91	41.0	29.90	40.5	29.92	34.0	41.5	27.5	14.0	34.50	-
8	29.80	28.5	29.61	39.5	29.48	38.5	39.5	13.5	26.0	26.50	*0.01
9	29.99	13.5	29.77	21.0	29.80	22.5	22.5	10.0	12.5	16.25	*0.06
10	29.93	13.5	29.94	12.0	30.04	10.0	13.5	7.5	6.0	10.50	-
11	30.60	11.5	30.32	17.5	30.21	36.0	37.5	11.0	26.5	24.25	0.52
12	29.99	35.0	30.06	42.5	30.20	37.5	51.5	35.0	16.5	43.25	-
13	29.82	42.5	29.63	57.0	29.56	56.0	57.0	29.0	28.0	43.00	-
14	30.43	30.0	30.58	32.0	30.66	26.5	35.5	22.5	13.0	29.00	-
15	30.49	35.5	30.23	37.0	29.98	36.0	45.5	31.5	14.0	38.50	-
16	29.58	45.5	29.53	45.0	29.69	36.5	51.5	9.5	42.0	30.50	0.12
17	30.4	14.5	30.5	19.5	30.5	22.0	30.0	15.0	15.0	22.50	-
18	30.5	30.0	30.43	38.0	30.42	34.5	40.0	22.5	17.5	31.25	-
19	30.44	24.0	30.36	39.0	30.29	38.0	41.5	24.0	17.5	32.75	-
20	29.76	41.5	29.54	52.5	29.53	53.5	54.0	32.5	21.5	43.25	0.01
21	29.83	35.0	29.89	37.5	29.88	36.5	38.5	19.5	19.0	29.00	-
22	29.90	19.5	30.11	20.0	30.40	15.0	21.0	10.5	10.5	15.75	-
23	30.52	11.0	30.42	22.0	30.23	22.5	27.0	11.0	16.0	19.00	*0.05
24	29.94	23.0	30.02	23.0	30.20	19.5	23.0	9.0	14.0	16.00	-
25	30.29	17.0	30.05	34.0	29.86	36.5	39.0	20.0	19.0	29.50	-
26	29.77	34.5	29.79	45.0	29.84	40.0	45.5	32.5	13.0	39.00	0.41
27	29.71	33.5	29.78	29.0	29.99	26.5	33.0	11.5	21.5	22.25	*0.05
28	30.41	11.5	30.48	18.0	30.53	17.5	25.0	12.0	13.0	18.50	-
29	30.37	25.0	30.23	42.0	30.12	40.5	44.0	26.0	18.0	35.00	0.20
30	30.16	37.0	30.21	34.0	30.36	25.0	38.0	20.0	18.0	29.00	*0.01
31	30.38	25.5	30.29	30.0	30.18	34.5	39.0	26.0	13.0	32.50	0.01

Monthly range	55.5°
Monthly mean	30.77°
Monthly rainfall	1.82

* Snow.

Meteorological Record for February, 1890.

	8. A. M.		I P. M.		6 P. M.		24 HOURS ENDING 8 P. M.				
Date.	Barometer.	Thermometer.	Barometer.	Thermometer.	Barometer.	Thermometer.	Maximum Thermometer.	Minimum Thermometer.	Daily range.	Daily mean.	Rainfall.
1	30.21	39.0°	30.32	40.0°	30.50	27.5°	42.5°	22.5°	20.0°	32.50°	–
2	30.64	30.0	30.55	35.5	30.50	36.0	38.5	30.0	8.5	34.25	0.10
3	30.10	34.5	29.94	43.5	29.92	43.5	46.0	32.0	14.0	39.00	–
4	30.18	32.0	30.16	36.5	30.05	37.0	51.0	30.0	21.0	40.50	0.11
5	29.39	51.0	29.37	54.0	29.58	39.0	59.5	18.0	41.5	38.75	–
6	30.08	18.0	30.18	24.0	30.25	22.0	25.0	9.5	15.5	17.25	–
7	30.65	13.5	30.67	22.5	30.65	23.5	43.0	13.0	30.0	28.00	0.12
8	29.80	43.0	29.53	55.0	29.60	39.0	57.0	29.0	28.0	43.00	0.55
9	30.09	29.0	30.22	32.0	30.39	25.0	32.5	18.0	14.5	25.25	–
10	30.59	18.0	30.59	26.0	30.59	25.0	27.0	18.0	9.0	22.50	*0.02
11	30.55	22.0	30.54	32.0	30.48	31.0	38.0	23.0	15.0	30.50	–
12	30.07	38.0	29.92	43.0	29.90	40.5	43.5	28.5	15.0	36.00	–
13	30.10	31.5	30.12	43.5	30.08	44.5	43.5	30.5	13.0	37.00	–
14	30.01	37.0	29.91	48.0	29.76	45.0	52.0	38.0	14.0	45.00	0.29
15	29.47	42.0	29.61	46.5	29.70	41.0	46.0	10.5	35.5	28.25	–
16	30.16	16.5	30.18	31.0	30.16	32.0	35.5	16.5	19.0	26.00	–
17	30.10	33.5	30.14	39.0	30.10	36.0	39.0	33.5	5.5	36.25	0.24
18	29.76	39.5	29.76	23.0	29.84	23.0	39.5	19.0	20.5	29.25	*0.09
19	29.86	20.0	30.04	28.0	30.17	24.0	32.0	20.0	12.0	26.00	*0.39
20	29.68	32.0	29.38	33.5	29.46	28.5	36.5	8.0	28.5	22.25	*0.11
21	29.44	8.0	29.88	12.5	29.89	12.0	14.0	5.0	9.0	9.50	–
22	29.96	6.0	29.95	15.5	30.01	15.0	25.0	7.0	18.0	16.00	–
23	30.04	24.0	30.02	41.0	30.03	35.5	41.0	26.5	14.5	33.75	–
24	30.01	37.0	30.02	42.0	29.98	38.0	43.5	37.0	6.5	40.25	0.02
25	30.05	40.0	30.02	41.0	29.96	40.0	42.5	36.5	6.0	39.50	0.66
26	29.74	36.5	29.78	45.0	29.84	43.0	51.5	36.5	15.0	44.00	–
27	30.20	40.0	30.21	40.0	30.22	38.0	40.5	37.5	3.0	39.00	–
28	30.16	38.5	30.06	40.0	29.91	39.0	40.5	38.0	2.5	39.25	0.35

Monthly range . . . . 54.5°

Monthly mean . . . . 32.09°

Monthly rainfall 3.05

* Snow.

Meteorological Record for March, 1890.

	8 A. M.		1 P. M.		6 P. M.		24 HOURS ENDING 8 A. M.				
Date.	Barometer.	Thermometer.	Barometer.	Thermometer.	Barometer.	Thermometer.	Maximum Thermometer.	Minimum Thermometer.	Daily range.	Daily mean.	Rainfall.
1	29.76	38.0°	29.76	43.5°	29.77	39.5°	44.0°	24.5°	19.5°	34.25°	*0.25
2	29.92	24.0	29.94	25.0	29.92	22.0	25.0	16.5	8.5	20.75	*0.50
3	29.77	17.5	29.88	24.5	29.96	24.5	25.5	13.5	12.0	19.50	–
4	30.20	18.5	30.13	33.0	30.12	34.0	38.5	18.5	20.0	28.50	–
5	30.02	39.0	30.00	42.0	30.06	37.0	48.5	22.5	26.0	35.50	*0.11
6	30.10	22.5	29.97	24.5	29.94	21.5	26.0	4.5	21.5	15.25	*0.21
7	30.14	6.5	30.16	17.5	30.15	17.5	20.5	6.5	14.0	13.50	–
8	36.20	14.0	30.20	27.0	30.19	27.5	30.0	15.0	15.0	22.50	–
9	30.35	21.0	30.38	29.0	30.41	29.0	32.0	17.0	15.0	24.50	–
10	30.45	21.5	30.41	40.5	30.37	41.5	47.5	21.5	26.0	34.50	–
11	30.34	37.0	30.25	38.0	30.17	41.5	43.0	37.0	6.0	40.00	0.08
12	30.08	43.0	30.08	53.0	30.08	58.0	60.5	43.0	17.5	51.75	–
13	30.08	53.0	30.05	62.5	30.08	53.0	62.5	43.0	19.5	52.75	0.08
14	30.11	43.0	30.07	39.5	30.02	33.0	43.0	33.5	9.5	38.25	*0.89
15	29.84	33.5	29.77	36.0	29.69	35.5	38.0	28.0	10.0	33.00	*0.40
16	29.55	29.5	29.48	37.5	29.45	34.5	40.0	18.0	22.0	29.00	–
17	29.49	20.5	29.48	33.0	29.49	37.0	38.0	21.5	16.5	29.75	–
18	29.56	34.0	29.57	44.0	29.62	40.5	44.5	30.0	14.5	37.25	–
19	29.79	29.5	29.65	27.5	29.61	23.0	30.5	20.0	10.5	25.25	*0.26
20	30.02	28.0	30.02	41.0	29.97	40.0	43.0	28.0	15.0	35.50	0.01
21	29.68	40.0	29.51	49.0	29.56	51.5	50.5	39.5	11.0	45.00	0.01
22	29.85	45.0	29.81	45.0	29.76	39.0	46.0	33.5	12.5	39.75	1.48
23	29.61	36.0	29.73	38.5	29.89	35.0	38.5	24.0	14.5	31.25	0.02
24	30.31	24.3	30.36	33.0	30.37	35.5	36.0	25.0	11.0	30.50	–
25	30.49	33.0	30.44	38.0	30.31	39.5	47.5	33.5	14.0	40.50	0.36
26	29.74	47.5	29.54	52.5	29.57	47.0	57.0	35.0	22.0	46.00	–
27	29.73	39.0	29.78	43.0	29.84	41.5	44.5	29.5	15.0	37.00	*0.14
28	29.84	31.5	29.56	34.0	29.50	35.0	45.0	31.5	13.5	38.25	*0.79
29	29.47	36.0	29.49	38.0	29.56	35.0	40.0	28.0	12.0	34.00	*0.03
30	29.77	32.5	29.76	40.0	29.85	36.0	40.5	28.0	12.5	34.25	–
31	30.24	29.5	30.32	42.0	30.28	38.5	42.5	29.0	13.5	35.75	–

Monthly range	58.0°
Monthly mean	33.37°
Monthly rainfall	5.62

* Snow.

Meteorological Record for April, 1890.

	8. A. M.		1 P. M.		6 P. M.		24 HOURS ENDING 8 A. M.				
Date.	Barometer.	Thermometer.	Barometer.	Thermometer.	Barometer.	Thermometer.	Maximum Thermometer.	Minimum Thermometer.	Daily range.	Daily mean.	Rainfall.
1	30.20	34.5°	30.21	40.0°	30.29	35.5°	41.5°	27.5°	14.0°	34.50°	0.09
2	30.45	31.5	30.44	44.0	30.35	47.5	48.0	30.5	17.5	39.25	–
3	30.27	44.5	30.21	59.0	30.09	54.5	62.5	44.5	18.0	53.50	–
4	29.85	50.5	29.71	60.0	29.58	53.5	60.0	35.0	25.0	47.50	0.14
5	29.71	37.5	29.83	40.0	29.95	32.5	40.0	29.0	11.0	34.50	–
6	30.23	37.5	30.15	52.5	30.04	49.5	57.5	37.5	20.0	47.50	–
7	27.81	44.0	29.71	40.0	29.78	38.0	45.0	36.5	8.5	40.75	0.29
8	29.94	44.0	29.96	49.0	29.92	41.0	52.0	38.0	14.0	45.00	0.34
9	29.74	38.5	29.68	40.0	29.58	39.0	45.0	38.5	6.5	41.75	0.47
10	29.50	45.5	29.55	51.0	29.62	45.0	52.0	37.5	14.5	44.75	–
11	29.81	38.5	29.87	45.0	29.93	44.0	48.0	30.0	18.0	39.00	–
12	30.28	37.0	29.29	42.0	30.24	40.5	43.0	37.5	5.5	40.25	–
13	30.08	43.5	30.03	53.0	30.00	45.0	53.0	42.0	11.0	47.50	–
14	29.91	49.0	29.89	49.0	29.85	43.0	52.0	39.0	13.0	45.50	–
15	30.01	41.0	30.09	48.0	30.16	47.0	49.0	33.0	16.0	41.00	–
16	30.33	40.0	30.17	51.0	30.18	53.5	54.0	37.0	17.0	45.50	–
17	29.98	47.0	29.87	58.5	29.80	57.5	61.5	36.5	25.0	49.00	–
18	29.81	36.5	29.78	43.0	29.76	41.5	44.0	25.0	19.0	34.50	–
19	30.00	35.0	30.09	45.0	30.11	46.0	46.0	35.0	11.0	40.50	–
20	30.27	44.0	30.30	44.0	30.31	44.0	51.0	38.0	13.0	44.50	–
21	30.27	51.5	30.20	60.5	30.16	59.5	62.5	41.5	21.0	52.00	–
22	30.38	48.0	30.40	46.5	30.35	46.5	53.0	42.5	10.5	47.75	–
23	30.29	53.0	30.20	53.5	30.12	58.5	65.0	53.0	12.0	59.00	–
24	30.05	62.0	30.05	70.0	30.06	58.5	71.0	40.0	31.0	55.50	0.02
25	30.16	39.0	30.20	41.0	30.20	41.5	44.0	35.0	9.0	39.50	0.05
26	30.43	41.0	30.45	42.0	30.40	40.5	43.0	40.0	3.0	41.50	0.70
27	29.98	41.5	29.91	42.0	29.85	41.0	48.5	39.5	9.0	44.00	0.09
28	29.85	44.5	30.03	52.0	30.20	47.0	51.0	42.5	8.5	46.75	–
29	30.09	42.5	30.04	51.0	29.96	52.0	53.0	43.0	10.0	48.00	–
30	29.92	48.5	29.85	58.0	29.80	53.0	58.0	57.0	1.0	57.50	–

Monthly range	46.0°
Monthly mean	44.92°
Monthly rainfall	2.19

Meteorological Record for May, 1890.

	8 A. M.		1 P. M.		6 P. M.		24 HOURS ENDING 8 A. M.				
Date.	Barometer.	Thermometer.	Barometer.	Thermometer.	Barometer.	Thermometer.	Maximum. Thermometer.	Minimum Thermometer.	Daily range.	Daily mean.	Rainfall.
1	29.77	58.0°	29.73	67.5°	29.85	55.0°	70.0°	39.0°	31.0°	54.50°	0.16
2	30.11	41.0	30.15	43.0	30.14	43.0	45.5	39.5	6.0	42.50	-
3	30.15	45.5	30.06	60.0	30.00	57.0	60.0	46.5	13.5	53.25	-
4	29.97	57.0	29.94	63.5	29.90	60.0	63.5	51.0	12.5	57.25	0.92
5	29.66	57.5	29.62	66.0	29.60	64.0	65.5	54.0	11.5	59.75	0.01
6	29.67	57.5	29.62	62.5	29.60	58.0	63.0	47.0	16.0	55.00	1.05
7	29.93	52.0	29.95	60.0	29.96	53.0	61.0	47.0	14.0	54.00	-
8	29.98	47.0	29.95	46.0	29.94	45.5	48.0	40.0	8.0	44.00	0.39
9	30.05	48.5	30.05	58.5	29.96	53.0	63.0	48.0	15.0	55.50	-
10	29.87	64.0	29.56	61.0	29.86	61.5	64.0	46.0	18.0	55.00	0.22
11	30.00	49.5	36.00	54.5	30.12	53.5	63.5	41.0	22.5	52.25	-
12	30.16	51.5	30.08	52.0	29.98	49.0	54.0	46.5	7.5	50.25	-
13	29.92	50.5	29.84	63.0	29.81	60.5	65.0	52.0	13.0	58.50	0.05
14	29.67	58.5	29.68	73.0	29.68	69.0	75.0	57.5	17.5	66.25	0.26
15	29.84	66.0	29.82	60.0	29.83	59.0	70.0	55.0	15.0	62.50	0.34
16	29.90	61.5	29.65	65.0	29.84	62.0	68.0	45.0	23.0	56.50	-
17	29.94	53.0	29.86	51.0	29.79	61.0	62.0	42.0	20.0	52.00	-
18	30.06	53.0	30.07	62.5	30.06	60.0	62.0	49.5	12.5	55.75	-
19	30.11	62.0	29.97	65.0	29.92	64.5	71.0	60.0	11.0	65.50	0.01
20	29.82	65.0	29.68	68.0	29.58	62.0	68.0	45.0	23.0	56.50	0.40
21	30.06	48.5	30.17	54.0	30.19	53.0	57.0	44.0	13.0	50.50	-
22	30.28	52.5	30.30	57.0	30.29	49.0	59.0	41.0	18.0	50.00	-
23	30.19	51.0	30.13	55.0	30.06	44.0	58.0	48.0	10.0	53.00	-
24	30.03	58.0	30.03	57.0	30.05	57.0	61.0	47.5	13.5	54.25	-
25	30.21	55.5	30.24	57.0	30.24	51.5	54.5	47.5	7.0	51.00	-
26	30.24	47.5	30.20	56.0	30.14	52.5	55.5	49.5	6.0	52.50	0.58
27	29.92	49.5	29.85	59.0	29.80	54.0	58.0	49.5	8.5	53.75	0.95
28	29.75	58.5	29.71	64.0	29.76	50.0	66.0	48.0	18.0	57.00	0.09
29	29.96	55.5	29.96	59.0	29.94	54.5	58.5	50.0	8.5	54.25	-
30	29.95	58.0	29.90	61.5	29.86	59.0	63.0	46.0	17.0	54.50	-
31	29.76	63.0	29.68	72.0	29.68	71.0	72.5	50.0	22.5	61.25	-

Monthly range	36.0°		
Monthly mean		54.78°	
Monthly rainfall			5.43

Meteorological Record for June, 1890.

	8. A. M.		1 P. M.		6 P. M.		24 HOURS ENDING 8 A. M.				
Date.	Barometer.	Thermometer.	Barometer.	Thermometer.	Barometer.	Thermometer.	Maximum Thermometer.	Minimum Thermometer.	Daily range.	Daily mean.	Rainfall.
1	29.84	67.0°	29.82	77.5°	29.82	79.5°	75.0°	53.0°	22.0°	64.00°	-
2	29.89	65.0	29.89	68.0	29.93	62.0	68.0	51.5	16.5	59.75	-
3	30.09	57.5	30.10	60.0	30.05	64.0	65.0	54.0	11.0	59.50	0.38
4	30.06	54.0	29.99	60.0	29.96	57.0	64.0	51.0	13.0	57.50	0.32
5	29.96	52.0	29.98	55.0	29.99	55.0	58.0	51.0	7.0	54.50	0.27
6	29.98	53.0	30.01	56.0	29.93	51.0	59.0	51.0	8.0	55.00	0.44
7	29.79	61.0	29.78	68.5	29.79	66.0	71.0	50.5	20.5	60.75	-
8	30.10	55.5	30.14	64.0	30.16	75.0	67.0	53.0	14.0	60.00	-
9	30.12	67.0	30.09	74.0	30.11	69.0	76.0	49.0	27.0	62.50	-
10	30.21	61.0	30.15	72.0	30.08	74.0	75.0	61.0	14.0	68.00	-
11	29.95	69.0	29.87	80.0	29.80	70.0	83.0	51.0	32.0	67.00	0.04
12	29.95	52.0	29.97	51.0	29.97	50.5	53.0	49.0	4.0	51.00	0.57
13	29.91	49.0	29.90	50.0	29.89	51.0	55.0	49.0	6.0	52.00	0.66
14	29.90	55.0	29.91	57.5	29.90	54.0	62.0	49.5	12.5	55.75	0.01
15	30.06	60.0	30.10	63.5	30.14	65.0	63.0	50.0	13.0	56.50	-
16	30.25	53.0	30.26	63.0	30.21	68.0	69.0	55.0	14.0	62.00	-
17	30.11	67.0	30.00	77.0	29.95	78.0	77.0	63.0	14.0	70.00	-
18	29.84	72.0	29.79	78.0	29.73	81.0	81.0	59.0	22.0	70.00	-
19	29.79	70.0	29.81	75.5	29.88	71.0	76.0	54.0	22.0	65.00	-
20	30.13	57.5	30.15	58.0	30.13	61.0	65.0	51.0	14.0	58.00	-
21	30.10	65.0	30.05	71.0	30.00	66.0	71.5	56.5	15.0	64.00	-
22	29.94	63.0	29.95	65.0	30.00	60.5	63.0	54.0	9.0	58.50	-
23	30.06	61.0	30.07	63.0	30.03	61.0	65.0	59.0	6.0	62.00	-
24	30.02	65.0	30.00	74.0	29.91	70.0	74.0	64.0	10.0	69.00	0.09
25	29.75	71.5	29.72	80.0	29.71	80.0	80.0	65.0	15.0	72.50	-
26	29.70	70.0	29.70	75.0	29.69	75.5	77.0	59.0	18.0	68.00	0.02
27	29.76	61.0	29.79	62.5	29.79	66.0	69.0	57.0	12.0	63.00	-
28	29.78	67.0	29.76	64.0	29.75	63.0	69.0	54.0	15.0	61.50	-
29	29.87	67.0	29.87	71.0	29.87	70.5	70.0	53.0	17.0	61.50	-
30	29.91	69.0	29.90	77.0	29.88	77.0	78.0	64.0	14.0	71.00	-

Monthly range	34.0°
Monthly mean	61.99°
Monthly rainfall	2.80

Meteorological Record for July, 1890.

	8 A. M.		1 P. M.		6 P. M.		24 HOURS ENDING 8 A. M.				
Date.	Barometer.	Thermometer.	Barometer.	Thermometer.	Barometer.	Thermometer.	Maximum Thermometer.	Minimum Thermometer.	Daily range.	Daily mean.	Rainfall.
1	29.96	70.5°	30.00	70.0°	29.98	67.0°	73.0°	62.0°	11.0°	67.50°	–
2	29.99	64.0	29.99	66.5	29.92	72.0	72.5	64.5	8.0	68.50	–
3	29.83	69.0	29.82	75.0	29.81	74.0	76.0	65.0	11.0	70.50	0.02
4	29.80	76.0	29.80	73.5	29.78	76.5	76.0	68.0	8.0	72.00	0.09
5	29.84	73.0	29.87	79.0	29.90	76.0	80.0	56.0	24.0	68.00	–
6	30.05	69.5	30.06	74.5	30.05	77.5	73.0	60.0	13.0	66.50	–
7	30.06	72.0	30.06	73.5	30.01	71.5	75.0	65.0	10.0	70.00	0.01
8	29.93	74.0	29.84	86.0	29.74	87.0	89.0	74.0	15.0	81.50	–
9	29.63	76.0	29.67	78.0	29.73	72.0	80.0	49.0	31.0	64.50	–
10	29.96	57.0	29.96	65.5	30.00	63.0	66.5	51.5	15.0	59.00	–
11	30.15	61.0	30.16	64.5	30.16	66.0	66.0	52.0	14.0	59.00	–
12	30.15	63.5	30.13	66.0	30.12	61.0	69.0	57.0	12.0	63.00	–
13	30.09	69.5	30.09	71.5	30.08	71.0	71.0	55.0	16.0	63.00	–
14	30.07	63.0	30.17	68.5	30.04	68.5	72.5	62.5	10.0	67.50	–
15	30.02	72.5	29.99	84.0	29.60	83.5	87.0	71.0	16.0	79.00	–
16	30.01	76.5	30.02	86.0	30.00	88.0	89.0	65.0	24.0	77.00	–
17	30.00	74.5	29.93	74.0	29.81	78.0	79.0	65.0	14.0	72.00	–
18	29.81	68.0	29.88	70.0	29.90	70.5	72.0	57.0	15.0	64.50	–
19	29.91	66.0	29.86	58.0	29.88	61.0	72.5	50.0	22.5	61.25	0.16
20	30.01	63.0	30.02	64.5	30.08	67.5	65.0	49.0	16.0	57.00	0.02
21	30.17	61.0	30.17	64.0	30.17	64.0	67.0	51.0	16.0	59.00	–
22	30.21	63.0	30.21	65.0	30.20	66.5	68.0	57.0	11.0	62.50	–
23	30.21	66.5	30.21	66.5	30.19	67.0	70.0	53.0	17.0	61.50	–
24	30.20	65.0	30.19	66.0	30.17	66.5	67.0	63.0	4.0	65.00	0.37
25	30.07	64.0	29.98	71.0	29.95	73.5	78.0	65.0	13.0	71.50	0.05
26	29.96	69.0	29.92	77.0	29.94	74.0	78.0	66.0	12.0	72.00	1.14
27	30.01	75.0	30.03	81.5	30.03	80.0	81.0	64.0	17.0	72.50	–
28	30.16	72.0	30.17	75.0	30.17	74.0	77.0	67.0	10.0	72.00	–
29	30.23	69.0	30.22	73.0	30.14	71.0	74.0	67.0	7.0	70.50	0.04
30	30.09	74.0	30.03	84.0	29.99	86.0	86.0	72.0	14.0	79.00	0.27
31	29.91	80.0	29.85	89.0	29.80	87.0	91.0	71.0	20.0	81.00	–

Monthly range . . . . 42.0°

Monthly mean . . . . 68.31°

Monthly rainfall 2.17

Meteorological Record for October, 1890.

	8 A. M.		1 P. M.		6 P. M.		24 HOURS ENDING 8 A. M.				
Date.	Barometer.	Thermometer.	Barometer.	Thermometer.	Barometer.	Thermometer.	Maximum Thermometer.	Minimum Thermometer.	Daily range.	Daily mean.	Rainfall.
1	30.27	62.0°	30.50	61.0°	30.30	56.0°	64.0°	45.0°	19.0°	54.50°	-
2	30.30	55.0	30.28	68.0	30.24	60.0	68.5	50.5	18.0	59.50	0.69
3	30.18	62.0	30.09	62.5	30.05	60.0	68.0	57.0	11.0	62.50	0.17
4	29.84	59.0	29.78	68.0	29.74	60.0	68 0	53.0	15.0	60.50	-
5	29.67	62.5	29.67	64.5	29.75	54.5	68.0	43.0	25.0	55.50	0.14
6	29.82	53.0	29.80	54.0	29.81	48.5	56.0	44.0	12.0	50.00	0.40
7	29.94	46.5	29.95	46.5	29.91	43.5	50.5	43.5	7.0	47.00	0.01
8	29.94	48.0	29 99	52.5	30.08	47.0	53.0	40.0	13.0	46.50	-
9	30.23	46.0	30.24	56.5	30.24	50.0	59.0	38.0	21.0	48.50	0.05
10	30.23	48.5	30.12	51.0	30.00	56.0	58.5	48.5	10.0	53.50	-
11	20.88	55.0	29.84	60.5	29.82	53.0	61.5	40.0	21.5	50.75	-
12	29.86	46.5	29.85	50.5	29.89	44.0	55.0	35.0	15.0	42.50	-
13	29.97	43.5	30.00	51.5	29.98	44.0	51.0	34.0	17.0	42.50	-
14	29.88	44.0	29.84	48.0	29.75	48.5	51.0	41.0	10.0	46.00	0.31
15	29.79	47.5	29.85	55.5	29.90	49.5	58.0	38.0	20.0	48.00	-
16	30.08	48.0	30.05	63.5	30.03	55.0	64.0	49.0	15.0	56.50	1.03
17	29.36	53.0	24.41	53.0	29.56	49.0	55.5	44.0	11.5	49.75	0.25
18	29.87	52.0	29.87	56.5	29.87	50.5	59.0	46.5	12.5	52.75	-
19	29.83	53.0	29.72	48.0	29.56	48.0	48.0	40.0	8.0	44.00	1.75
20	29.54	40.0	29.62	45.0	29.73	42 0	46.5	36.5	10.0	41.50	0 02
21	29.95	41.0	30.00	44.0	30.06	40.0	45.0	32.0	13.0	38.50	-
22	30.30	38.5	30.34	44.0	30.34	39.0	44.0	32.0	12.0	38.00	-
23	30.36	39.5	30.32	47.0	30.24	44.5	48.0	39.5	8.5	43.75	0.14
24	29.90	47.0	29 80	46.0	29.76	45.5	47.5	40.5	7.0	44.00	1.53
25	29.73	41.5	29.72	42.5	29.70	42.5	42.5	35.0	7.5	38.75	-
26	29.65	40.0	29.64	47.5	29.62	42.0	48.0	36.0	12.0	42.00	-
27	29.44	41.5	29.35	44.5	29.35	42.0	46.0	36.0	10.0	41.00	0.03
28	29.43	41.0	29.44	45.0	29.46	40.0	47 0	33.0	14.0	40.00	-
29	29.43	42.0	29.44	46.0	29.39	44.0	47.5	37.5	10.0	42.50	0.23
30	29.47	41.0	29.58	47.5	29.68	41 0	48.0	33.0	15.0	40.50	-
31	29.88	38.0	29.88	48.0	29.85	42.5	50.0	30.0	20.0	40.00	-

Monthly range	38.5°
Monthly mean	47.14°
Monthly rainfall	6.75

Meteorological Record for November, 1890.

	8. A. M.		1 P. M.		6 P. M.		24 HOURS ENDING 8 P. M.				
Date.	Barometer.	Thermometer.	Barometer.	Thermometer.	Barometer.	Thermometer.	Maximum Thermometer.	Minimum Thermometer.	Daily range.	Daily mean.	Rainfall.
1	29.90	37.0°	29.92	44.5°	29.93	41.5°	46.0°	35.5°	10.5°	40.75°	-
2	29.85	44.5	29.79	53.0	29.72	47.0	54.0	38.0	16.0	46.00	-
3	29.69	40.0	29.70	47.0	29.69	43.0	48.0	27.0	21.0	37.50	-
4	29.76	31.0	29.78	37.5	29.85	34.0	37.0	25.0	12.0	31.00	-
5	30.17	32.0	30.19	45.5	30.15	41.5	45.0	33.0	12.0	39.00	-
6	30.17	41.5	30.18	52.5	30.20	48.5	53.0	41.5	11.5	47.25	-
7	30.30	41.5	30.26	48.0	30.20	45.5	53.0	42.0	11.0	47.50	-
8	29.96	53.0	29.95	60.5	30.13	47.0	61.0	36.0	25.0	48.50	-
9	30.33	42.5	30.22	50.5	30.02	48.0	56.0	43.0	13.0	49.50	-
10	29.96	56.0	30.10	50.5	30.21	42.0	56.0	32.0	24.0	44.00	-
11	30.30	32.5	30.28	34.0	30.30	33.0	34.0	32.0	2.0	33.00	0.20
12	30.30	34.0	30.25	38.0	30.22	36.0	35.0	27.0	8.0	31.00	0.03
13	30.15	30.5	30.12	41.0	30.08	38.5	39.0	31.0	8.0	35.00	-
14	30.04	37.0	30.07	48.0	30.12	40.5	48.5	34.0	14.5	41.25	-
15	30.28	38.5	30.25	49.0	30.18	45.0	48.0	39.0	9.0	43.50	0.25
16	30.23	40.0	30.31	44.0	30.31	38.5	44.9	32.0	12.0	38.00	-
17	30.12	41.0	29.94	45.0	29.69	46.0	48.0	40.0	8.0	44.00	0.98
18	29.40	43.5	29.63	48.0	29.78	40.0	48.0	32.5	15.5	40.25	-
19	29.72	42.0	29.62	50.0	29.60	42.0	50.0	31.0	19.0	40.50	-
20	29.58	33.0	29.60	34.0	29.70	29.0	34.0	27.0	7.0	30.50	-
21	29.97	28.5	30.02	36.0	30.01	33.0	38.0	28.5	9.5	33.25	-
22	29.76	38.0	29.76	42.5	29.83	32.5	44	29.0	15.0	36.50	0.01
23	29.79	21.0	29.78	29.5	29.90	22.0	29.5	15.0	14.5	22.25	0.01
24	30.08	20.0	30.12	31.0	30.08	31.0	40.0	21.5	18.5	30.75	-
25	29.86	40.0	29.76	51.0	29.72	43.0	52.0	30.0	22.0	41.00	-
26	29.93	34.0	30.01	35.0	30.02	29.0	37.0	23.0	14.0	30.00	-
27	30.02	24.5	29.99	31.0	29.98	28.0	31.0	13.0	18.0	22.00	-
28	29.98	16.0	29.97	25.0	29.95	23.0	26.0	16.0	10.0	21.00	-
29	29.92	26.0	29.86	37.0	29.88	37.0	37.0	27.0	10.0	32.00	-
30	29.80	32.0	29.68	40.0	29.62	32.5	40.0	19.0	21.0	29.50	-

Monthly range	48.0°
Monthly mean	36.87°
Monthly rainfall	1.48

Meterorological Record for December, 1890.

	8 A. M.		1 P. M.		6 P. M.		24 HOURS ENDING 8 A. M.				
Date.	Barometer.	Thermometer.	Barometer.	Thermometer.	Barometer.	Thermometer.	Maximum Thermometer.	Minimum Thermometer.	Daily range.	Daily mean.	Rainfall.
1	29.55	19.0°	29.59	22.5°	29.66	18.0°	22.5°	3.0°	19.5°	12.75°	–
2	29.94	6.5	30.03	18.0	30.08	13.5	18.0	1.0	17.0	9.50	–
3	30.39	7.0	30.28	13.0	30.05	33.5	45.0	7.0	38.0	26.00	1.15
4	29.47	30.0	29.73	27.0	29.94	24.0	30.0	22.0	8.0	26.00	–
5	30.21	28.0	30.21	31.0	30.22	29.0	31.0	21.0	10.0	26.00	*0.14
6	30 30	23.5	30.23	31.0	30.14	31.0	36.0	23.5	12.5	29.75	*0.24
7	29.87	32.0	29.97	26 5	30.10	17.0	32.0	9.0	23.0	20.50	–
8	30.26	13.0	30.24	23.0	30.18	19 5	23 0	13.0	10.0	18.00	–
9	29.95	16.5	29.87	30.0	29.80	30.0	30.0	16.0	14.0	23.00	–
10	29.72	23.5	29.62	34.5	29.54	31.5	34.5	23.5	11.0	29.00	–
11	29.60	30.0	29.62	37.0	29.62	34.0	37.0	29.0	8.0	33.00	–
12	29.51	29.0	29.59	30.0	29.77	11.0	30.0	3.0	27.0	16.50	–
13	30.09	6.0	30.18	16.0	30.15	17.0	30.0	6.0	24.0	18.00	–
14	30.03	30.5	29.92	40.5	29.96	34.0	40.5	21.0	19.5	30.75	–
15	30 08	26.0	30.18	34.0	30.26	29.5	34.0	15.0	19.0	24.50	–
16	30.50	17.0	30.50	26.0	30.50	24 0	37.0	17.0	20.0	27.00	–
17	30.26	37.0	30.10	39.0	29 88	39.0	39.0	32.0	7.0	35.50	1.70
18	29.44	32.0	29.42	36.0	29.42	31.0	36.0	14.0	22.0	25.00	–
19	29.87	14.0	29.98	18.0	30.12	12.0	18.0	7.0	11.0	12.50	–
20	30.44	11.0	30.49	22.5	30.42	22.0	31.5	12 0	19.5	21.75	–
21	30.21	31.5	30.01	41.0	29.84	36.0	41.0	31.5	9.5	36.25	–
22	29.78	34.0	29.86	36.0	29.96	28.5	36.0	26.0	10.0	31.00	–
23	29.79	32.5	29.71	46.0	29.71	38.5	46.0	22.0	24.0	34.00	–
24	29.85	24.0	29.97	25.0	30.08	20.0	26.0	11.0	15.0	18.50	–
25	30.43	14 5	30.48	16.0	30.52	10.0	17.0	5.0	12.0	11.00	–
26	30.55	13.0	30.39	35.0	30.15	28.0	35.0	12.0	23.0	23.50	*1.32
27	29.37	26.0	29.39	30.5	29.41	25.0	32.0	17.0	15.0	24.50	–
28	29.63	18.5	29.73	18.5	29.86	7.5	21.5	2.0	19.5	11.75	–
29	29.79	15.5	29.74	26.5	29.80	20.0	28.0	2.0	26.0	15.00	–
30	30.34	4.0	30.40	13.0	30.40	11.0	15.0	3.0	12.0	9.00	–
31	30.36	10.5	30.34	16.5	30.33	11.0	20.0	8.0	12.0	14.00	–

Monthly range . . . . 45.0°

Monthly mean . . . . 22.37°

Monthly rainfall 4.55

* Snow.

1912

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TWENTIETH ANNUAL REPORT

OF THE

PUBLIC WATER BOARD

OF THE

CITY OF LYNN.

FOR THE YEAR ENDING DECEMBER 31, 1891.

LYNN, MASS.:
WHITTEN & CASS, PRINTERS,
1892.

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TWENTIETH ANNUAL REPORT

OF THE

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OF THE

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FOR THE YEAR ENDING DECEMBER 31, 1891.

Compliments of the

★ *Public Water Board.*

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1892.

R. L. M.

OFFICERS FOR 1891.

Edwin Bates,
For one year.

E. B. Billings,
For two years.

Quincy A. Towns,
For three years.

W. B. Littlefield,
For four years.

David Knox, ***President,***
For five years.

Superintendent and Clerk, John C. Haskell.
Water Registrar, Wallace O. Mudge.
Pumping Engineer, W. H. Messinger.
Foreman of Mains, Edwin Maxwell.
Foreman of Services, Henry Wheelock.
Inspectors, Winslow J. Rowell, W. B. Moulton, J. Frank Pool.

PUBLIC WATER BOARD FOR 1892.

Edward B. Billings, for one year.
Quincy A. Towns, for two years.
W. B. Littlefield, for three years.
David Knox, for four years.
D. A. Sutherland, for five years.

ANNUAL REPORT.

OFFICE OF THE PUBLIC WATER BOARD,
January 1, 1892.

To the Honorable Mayor and City Council of the City of Lynn:

The Public Water Board hereby presents to the City Council its twentieth annual report, together with the reports of the Superintendent and Registrar. These reports present in full detail the practical workings of the department, besides giving much information and many tables of great value and interest to the public.

THE NEW PONDS.

In our last annual report we outlined the necessity of deepening Walden Pond at the outlet of Penny Brook. This work has been successfully accomplished; the pond has been materially deepened, the unsightly stumps and muck removed, the roadbed raised, and a clean, gravelly shore formed all around the bend, which we confidently expect will do much in lessening the tendency towards a filthy growth of unwholesome-looking vegetable matter.

The very hot and dry weather of the past summer has severely tried the capabilities of our watersheds and storage basins for furnishing a pure and wholesome supply of water, and on the whole, the city has reason, we think, to feel justly proud of its whole water system. While the new ponds developed a considerable amount of algæic growth, and slight traces were also discernable in both Birch and Breed's Ponds, at no time, except for a few days, has there been any cause for complaint on account of bad or unwholesome water. We have, on the contrary, the following strong testimony to the remarkable purity of the water furnished our citizens, taken from a report made to the Thomson-Houston Welding Co., who had dug a deep well on their premises, and sent a sample of their well water, marked No. 1, a sample of the city water taken from a faucet in their factory, marked No. 2, and a sample from another well in the vicinity, marked No. 3. These samples of water were sent to the Hartford Steam Boiler Inspection Co. for analysis, and they say Nos. 1 and 3 are not so different as No. 2. This is a most remarkable water, and, as our chemist says, he is unable to account for it If it was collected directly after a heavy rain, that might give some ground for its purity, but it is in the condition in which it arrived here, softer than any water which we have had here for many years, if ever before. "It is softer than rain water as ordinarily collected, and only the purest springs and lakes approach it."

STORAGE CAPACITY.

The great need of the future in our water supply system will be additional storage capacity. We had in our ponds at the beginning of last summer a billion gallons of water (theoretically a whole year's supply), yet so great was the evaporation, and so large the consumption of water through the hot, dry months of summer, that November found us with our ponds well drained of their contents.

In no department of our municipal administration is there so great need of wise foresight and prudent management in foreseeing and providing for the needs of the future as in the care of our Water Department. A happy-go-lucky policy of trusting to come out all right in spite of contingencies is a mistaken and foolish policy. No chances should be taken and no stone left unturned in foreseeing and providing for all possibilities, and it is the judgment of this Board that the work of finishing up the system of ponds as planned by Engineer Kirkwood should be commenced in the near future and carried out in all its completeness, by the construction of the Basin on Hawkes Brook, the connection of that with Walden Pond by canal, and completing the connection by pipe of Walden and Birch Ponds. A large amount of the water which Hawkes Brook furnishes is liable to run to waste to the river, which, by the completion of these works, could all be utilized in filling up the ponds below.

OUR MAINS.

Authority having been received from the City Council last year to lay a new twenty-inch main from the reservoir to the centre of the city (as recommended in our last annual report), a contract was made for the pipe, but owing to the delay in sending it, it was found to be impossible to commence the work the past season. The pipe is all on hand now, however, and the work can be completed early next year. This, when laid, will insure a much steadier maximum pressure of water through all our mains than has heretofore been possible.

Satisfactory progress has also been made in taking up the old cement-lined mains in our principal streets and replacing them with larger cast iron mains. Much, however, yet remains to be done to complete the work. A new supply main from Birch Pond to the pumping station is needed at once, and should be put in as soon as practicable.

THE NEW BOILER AND PUMP.

In accordance with authority granted by the City Council, contracts were made to place in the engine-house a Moore's water-tube boiler of 180 horse power, at a cost of $3,650. This has been set up and tested, and appears to furnish steam with great economy. This, with the Loretz pumping engine erected last year, promises to be a great acquisition to our equipment.

LAND PURCHASES.

For the protection of our supply from contamination the Board has made the following purchases during the past year:

G. W. Quint, 4 acres	$200 00
E. W. and W. S. Ford, 4 acres, 120 rods	500 00
J. W. Oliver et ali., 3 acres, 120 rods	125 00
Sarah A. Silver, 3 acres, 120 poles	225 00
Isaiah Graves, 1 acre, 26 rods	100 00
E. A. Aldworth, lots 21 to 42, 156 to 160, and part of lot 161,	6,000 00

This parcel of land is below Birch Pond dam, and by its purchase the city is forever released from any danger of expensive law suits on account of the leakage of water from the dam. These purchases substantially complete the purchase of lands on the margin of our several basins.

A proposition has been submitted to the Board by the Public Park Commissioners to co-operate with them in the purchase of lands to the north of Walden and Glen Lewis Ponds which lie directly on our watershed, to prevent forever the settlement on these lands of any contaminating influences. This proposition merits, and ought to receive, our most careful consideration. Should this project ever be carried out to completeness, it would, in our judgment, be well to place the whole of the forest domain under the protection and restrictive powers of the Forest Commission.

FINANCIAL.

The appended statement shows the condition of our finances. It shows a healthy growth in our receipts, the increase the past season, as will be seen, being nearly $17,000. This testifies forcibly to the faithful and efficient work of our Inspectors and Registrar. The large increase in cost of maintenance by $10,000 is due to replacing the old mains with new ones, which has been charged to maintenance instead of construction.

WATER DEBT STATEMENT FOR THE YEAR ENDING DEC. 20, 1891.

RECEIPTS AND EXPENDITURES.

Water debt December 20, 1890,	$1,677,500 00	
Amount borrowed during year ending December 20, 1891	75,000 00	
		$1,752,500 00
Amount of debt paid during year ending December 20, 1891		168,000 00
Amount of debt outstanding		$1,584,500 00

Receipts from water rates during year	$147,675 58	
Receipts from premiums, and accrued interest on loans	2,405 55	
		$150,081 13
Expenditures charged to water maintenance		113,275 08
Net receipts carried to sinking funds		$36,806 05
Appropriated to water sinking funds by City Council in 1891		20,000 00
Amount added to sinking funds by net water receipts and appropriations		$56,806 05

CONDITION OF SINKING FUNDS.

Amount of sinking funds Dec. 20, 1890, as per report of commissioners		$267,477 29
Amount paid to commissioners by city treasurer during year 1891, viz.:		
Net income from water maintenance	$43,649 02	
Appropriation by City Council, 1891	20,000 00	
Income from investments reported by commissioners	8,439 25	
		72,088 27
Total amount sinking funds		$339,565 56
Deduct amount paid on account of debt		168,000 00
Amount in hands of commissioners December 20, 1891		$171,565 56
Add net receipts from water maintenance not yet paid to commissioners		36,806 05
Total amount in hands of commissioners and in city treasury, of sinking funds, December 20, 1891		$208,371 61

Respectfully submitted,

DAVID KNOX,

President.

Report of the Water Registrar.

OFFICE OF THE WATER REGISTRAR,
LYNN, January 1, 1892.

To David Knox, Esq., President Public Water Board:

SIR,—I herewith present the financial condition of the department for the year ending December 31, 1891:

RECEIPTS.

Fixture rates		$111,805 18
Meter rates		29,855 44
Additional rates		4,074 57
Fines and summons		133 80
MISCELLANEOUS.		
Masons' permits and other purposes	$770 89	
Repairs	360 78	
Saugus (fire purposes)	280 00	
Sundry sales	236 80	
Rent of mill	200 00	
Interest	44 25	
Rent of pasture	30 00	
Turning on services	13 50	
Use of seal locks	3 00	
		1,939 22
Total revenue		$147,808 21
Extra pipe and labor	$10,926 04	
Sale of wood (new basin)	519 24	
		11,445 28
Total receipts as per cash book		$159,253 49

COMPARATIVE STATEMENT OF REVENUE.

Amount collected during the year		$147,808 21
City appropriation		20,000 00
Amount outstanding fixture rates	$3,444 51	
Amount outstanding meter rates	623 05	
Amount outstanding meter rates, not due	9,236 79	
		13,304 35
		$181,112 56
Deduct amount due January 1, 1891		9,367 71
Revenue for 1891		$171,744 85
Revenue for 1890		154,788 27
Increase		$16,956 58

STATEMENT OF NET EARNINGS FOR 1891.

Revenue		$171,744 85

EXPENSES.

Interest	$81,250 85	
Maintenance	30,872 86	
Rebate to Saugus	1,296 59	
		113,420 30
Net earnings		$58,324 55

EXPENDITURES.

MAINTENANCE.

Pumping	$9,454 52	
Repairs on mains	5,982 22	
Salaries and office expenses	5,625 32	
Repairs on services	3,027 29	
Stable and workshop	2,184 83	
Engines and boilers	1,113 14	
New supply	930 83	
Damages	752 93	
Meters	647 06	
Walden pond	524 91	
Engine house	240 02	
Reservoir	154 24	
Birch pond	138 50	
Breed's pond	97 05	
		$30,872 86

CONSTRUCTION.

Mains, hydrants and gates	$53,803 61	
Services and court mains	12,498 28	
Loretz pumping engine	12,237 92	
Birch pond	6,000 00	
Boiler	4,674 61	
Meters	2,726 59	
New basin	1,903 25	
New supply	750 00	
New force main	22 43	
		$94,616 69
Less amount due for pipe, etc.	10,926 04	
Less amount received for wood	519 24	
		11,445 28
Net cost		$83,171 41

STATEMENT

SHOWING COST OF WORKS TO JANUARY 1, 1892.

Mains, hydrants and gates		$736,448 56
New supply and land		236,336 58
Services and courts		236,272 96
New basin and land		177,758 87
Engines and boilers		139,681 64
Reservoir and land		131,581 49
Birch pond and land		93,471 84
Engine house and land		57,336 39
Breed's pond and land		55,247 78
Pipe conduit and land		45,293 98
Force mains and land		41,546 13
Meters		27,776 30
Highland service		12,350 67
Tubular wells		9,374 02
Engineering		8,564 99
Work shop and stable		1,957 12
Total cost		$2,010,999 32
Less amount received for pipe	$88,548 67	
Less amount received for wood	3,931 68	
Less amount received for Deane pump	2,000 00	
		94,480 35
Total net cost		$1,916,518 97

Following will be found the usual tables, exhibiting the number of buildings, families, stores, factories, etc., supplied with water, the class of premises to which meters are attached, the number and kinds of fixtures, the yearly revenues of the department, etc.

Respectfully submitted,

WALLACE O. MUDGE,

Water Registrar.

SERVICES.

Whole number of services	10,010
Put in during the year	653
Discontinued	97
Not in use	137
Turned on (new services)	514
Turned on (re-occupied)	95
Turned on (change of ownership)	16
Turned on (rates and fine paid)	5
Shut off (for vacancy)	182
Shut off (for non-payment)	18
Services put in at Saugus, 1891	55
Whole number at Saugus	347

The ratio of yearly increase in the number of services from 1876 is as follows:

1876	6.54 per cent.	1884	8.62 per cent.
1877	7.60 " "	1885	6.36 " "
1878	6.14 " "	1886	6.58 " "
1879	6.04 " "	1887	5.84 " "
1880	8.75 " "	1888	6.67 " "
1881	10.25 " "	1889	6.67 " "
1882	9.92 " "	1890	7.40 " "
1883	10.80 " "	1891	6.90 " "

STATEMENT

SHOWING THE NUMBER OF BUILDINGS TO WHICH WATER IS SUPPLIED, ALSO THE NUMBER OF FAMILIES, VARIOUS FIXTURES, ETC., CONTAINED IN THE SAME, TOGETHER WITH THE NUMBER OF FIRE HYDRANTS, DEC. 31, 1891.

	LYNN.	SAUGUS.	TOTAL.
Dwellings	8,567	311	8,878
Stores and shops	926	19	945
Factories	195		195
Offices	396	10	406
Restaurants and saloons	71		71
School-houses	41	2	43
Churches	26	1	27
Bakeries	32		32
Laundries	15		15
Engine-houses	6	3	9
Families	13,313	380	13,693
Boarding-houses	243		243
Faucets	22,962	626	23,588
Water-closets	7,510	97	7,607
Bath tubs	2,616	75	2,691
Hand hose	2,597	129	2,726
Urinals	248	2	250
Heaters	412	15	427
Stationary engines	145	2	147
Motors	18		18
Greenhouses	26	4	30
Drinking fountains	24		24
Standpipes, fire	15	1	16
Standpipes for water carts	36		36
Sewer connections	16		16
Automatic sprinklers	46		46
Hydrants	706	94	800

STATEMENT

SHOWING THE YEARLY REVENUE OF THE DEPARTMENT SINCE THE FIRST INTRODUCTION OF WATER INTO THE CITY IN 1871.

From October 1, 1871, to January 1, 1872	$8,989	00
From January 1, 1872, to January 1, 1873	27,568	16
From January 1, 1873, to January 1, 1874	47,992	61
From January 1, 1874, to January 1, 1875	53,545	61
From January 1, 1875, to January 1, 1876	52,553	26
From January 1, 1876, to January 1, 1877	60,867	12
From January 1, 1877, to January 1, 1878	64,002	50
From January 1, 1878, to January 1, 1879	67,570	14
From January 1, 1879, to January 1, 1880	73,949	80
From January 1, 1880, to January 1, 1881	79,635	12
From January 1, 1881, to January 1, 1882	80,967	76
From January 1, 1882, to January 1, 1883	94,419	52
From January 1, 1883, to January 1, 1884	98,893	54
From January 1, 1884, to January 1, 1885	114,903	86
From January 1, 1885, to January 1, 1886	110,089	11
From January 1, 1886, to January 1, 1887	116,375	70
From January 1, 1887, to January 1, 1888	123,507	73
From January 1, 1888, to January 1, 1889	134,480	27
From January 1, 1889, to January 1, 1890	141,865	53
From January 1, 1890, to January 1, 1891	154,788	27
From January 1, 1891, to January 1, 1892	171,744	85
	$1,878,709	46

Report of the Superintendent.

To David Knox, Esq., President Public Water Board:

Sir,—In compliance with the city ordinance, I respectfully herewith present the annual report of the Superintendent for the year ending Dec. 31, 1891.

WATER SUPPLY.

On the first of January, 1891, the total amount of water in all of the ponds was 886,647,463 gallons. The supply exceeded the consumption until April 6th, when the entire amount of water stored was 1,121,913,109 gallons. From this time the supply was less than the consumption until Dec. 19th, when the total supply was but 350,490,640 gallons, equal to 112 days' needs. This result shows that without the new supply from Walden and Glen Lewis ponds, we should have had an insufficient amount of water, and demonstrated beyond all doubt the necessity of their addition to our system. It also becomes evident that the time is not far distant when our supply must be increased. During the summer months the water of the new ponds became unfit for domestic use, and we were obliged to depend entirely upon Breed's and Birch ponds, which held a sufficient supply for this year, but was reduced to 81,253,901 gallons, equal to 26 days' demands, before the water in the upper ponds became fit for family use. The bad taste and odor was due to the presence of vegetable organisms, which may soon disappear. Should their presence continue for any length of time, it will become a serious injury to our water supply, and may make it necessary to filter the water for a portion of the year. No water was wasted during the year from Breed's or Birch ponds, and 471,828,060 gallons of water were taken from Breed's pond; 347,568,986 gallons from Birch pond, and 323,895,088 gallons through the canal, from Hawkes brook and Walden and Glen Lewis ponds, making a total of 1,143,292,134 gallons, being 175,955,770 gallons in excess of the amount pumped in 1890. The amount of water taken from each source monthly can be seen in Table III. An examination of the analysis of the water made by the State Board of Health will show the quality of water used.

CANAL.

The flumes and waste ways connecting both Hawkes and Penny brooks with the canal were rebuilt.

RESERVOIR.

The bridge to the gate house has been replaced with a new one. No other repairs are needed.

PUMPING STATION.

By the construction of a Moore Water Tube Boiler of 200 horse power capacity, we have sufficient boiler power to run both pumping engines together at their highest speed, pumping 15,000,000 gallons of water in 24 hours, and should either of the boilers become disabled, there would still be one able to furnish our daily supply without any delay. The necessary repairs on the old boilers have been made, the roof to the building, where leaky, has been repaired. New sides were put in for the coal bunkers. In December, the new boiler plant was put in under contract with Mr. A. J. L. Loretz, and is now complete and in operation. The plant consists of a complete outfit to run the new Loretz engine to its fullest capacity, and capable of furnishing over 200 horse power. The type of boiler is known as the National Water Tube and Moore's system. A heater, as economizer, has been connected with the plant to utilize the waste heat in the smoke connection. A hot water tank was connected with the Loretz engine to receive all the condensed water from the steam jackets, receiver, heater and other drips, and return the same back to the boiler. Previously this water of a high temperature had run to waste, consequently reducing the efficiency of the engine to a marked extent. The duty of the L. Loretz engine as herein recorded has not been as high as it might have been had the steam generated by the old boilers been of sufficient high pressure to run the new engine as designed. It was deemed unsafe to carry the required pressure on boilers that have been in constant use over 20 years. The recent work since the new boiler has been in operation has shown improved results.

WATER FOR FIRE SUPPLY.

In accordance with an order passed in the Board of Aldermen, June 30th, 1891, bids were called for to furnish 9,000 feet of 20" pipe. The contract was awarded to R. D. Wood & Co., who were the successful bidders. Owing to the delay in delivering the pipe, it was found to be impossible to commence the work the past season. The pipe is now on hand and the work will be started as early in the spring as the weather will permit.

STREET MAINS.

During the year the cement lined pipes in Willow, Almont, Mulberry and Buffum streets, Oxford, from Market street to Buffum street, Washington street, from Union to Oxford street, Ridgeway street, from Adams to Mt. Pleasant street, Munroe street, from Market to Washington street, South Common street, from Elm street to the Common, and Chippewa court, from Lewis street to the hydrant, were taken out and replaced with cast iron mains. In Bay View avenue, for 96 feet, and the Great Woods Road for 320 feet, the pipes were lowered on account of the change in the grade. Three thousand, nine hundred and thirty-nine feet of cast iron pipe, from 4" to 16" in diameter, has been laid in 78 streets; of this amount 6,665 feet was laid to replace the cement pipe formerly used. Three thousand one hundred and eighty feet of smaller size has been laid in courts, as mains; 201 services were changed from the old pipe to the new; 51 gates have been set in connection with the new mains; 47 hydrants have been set, 597 services have been put in, aggregating 26,954 feet in length; 48 services have been extended, of an aggregate length of 1,970 feet; 97 services have been discontinued. In trenching for mains, 2,923 feet of ledge has been excavated; 7 new hydrants set in place of old ones; 22 hydrants have been repaired; 5 hydrants changed in location; 26 new gate boxes set to replace old ones; 27 gates repaired; 14 gates taken out and replaced with new ones; 541 corporations have been dug up and drilled out; 261 new iron stop boxes put in place of decayed wooden ones; 97 stop-boxes raised where the walks were graded: 130 stop-boxes lowered; 91 new meters put in; 12 meters taken out; 68 meters changed and repaired; 10 outside meter boxes put in; 37 stop and wastes put in to replace old ones; 108 leaks in service pipes were repaired.

The following tables show the work performed by the department during the year.

Respectfully submitted,

JOHN C. HASKELL,

Superintendent.

ANALYSIS OF WATER IN BREED'S POND BY STATE BOARD OF HEALTH.

DATE OF		APPEARANCE.			ODOR.		RESIDUE ON EVAPO'TION			AMMONIA.					NITROGEN.		
							Filtered.				Albuminoid.						
Collection.	Examination.	Turbidity.	Sediment.	Color.	Cold.	Hot.	Total.	Loss on Ignition.	Fixed.	Free.	Total.	In Solution.	In Suspension.	Chlorine.	As Nitrates.	As Nitrites.	Hardness.
Feb. 12	Feb. 13	Very slight.	Very slight.	0.30			3.00	0.85	2.15	.0034	.0106	.0094	.0012	.34	.0060	.0001	0.79
Mar. 10	Mar. 11	Very slight.	Very slight.	0.40			2.95	1.45	1.50	.0000	.0064	.0054	.0010	.30	.0300	.0000	0.48
April 15	April 16	Very slight.	Very slight.	0.3	Very faintly vegetable.	Very faintly vegetable.	3.25	1.15	2.10	.0002	.0106	.0084	.0022	.39	.0150	.0001	0.79
May 13	May 14	Slight.	Slight.	0.3	Faintly vegetable.	Dist'ctly vegetable.	3.45	1.40	2.05	.0004	.0150	.0118	.0032	.41	.0020	.0000	0.79
June 10	June 12	Slight.	Slight.	0.3	Distinctly mouldy.	Very faint or none.	3.65	1.55	2.10	.0026	.0160	.0146	.0014	.37	.0050	.0000	0.8
Aug. 12	Aug. 13	Slight.	Slight.	0.2	Faintly vegetable; mouldy.	Distinctly mouldy.	3.20	1.35	1.85	.0006	.0152	.0128	.0024	.40	.0020	.0000	0.63
Sept. 10	Sept. 11	Slight.	Very slight.	0.2	Faintly vegetable.	Vegetable.				.0000	.0210	.0174	.0036		.0050	.0000	
Oct. 7	Oct. 8	Very slight.	Slight.	0.4	Faintly vegetable.	Dist'ctly vegetable.				.0012	.0288	.0246	.0042		.0050	.0000	
Nov. 4	Nov. 5	Very slight.	Slight.	0.65	Dist. vegetable; grassy.	Dist. vege'ble and grassy.	3.50	1.10	2.40	.0004	.0202	.0168	.0034	.48	.0100	.0002	0.63
Dec. 9	Dec. 10	Slight.	Slight.	0.60			3.35	1.60	1.75	.0000	.0140	.0106	.0034	.45	.0070	.0000	0.79

ANALYSIS OF WATER IN BIRCH POND BY STATE BOARD OF HEALTH.

DATE OF		APPEARANCE.			ODOR.		RESIDUE ON EVAPO'TION			AMMONIA.					NITROGEN.		
							Filtered.				Albuminoid.						
Collection.	Examination.	Turbidity.	Sediment.	Color.	Cold.	Hot.	Total.	Loss on Ignition.	Fixed.	Free.	Total.	In Solution.	In Suspension.	Chlorine.	As Nitrates.	As Nitrites.	Hardness.
Feb. 12	Feb. 13	Distinct.	Very slight.	0.20			2.95	0.85	2.10	.0000	.0250	.0142	.0108	.32	.0070	.0002	0.79
Mar. 10	Mar. 11	Slight.	Very slight.	0.00			2.25	0.70	1.55	.0006	.0068	.0052	.0016	.35	.0120	.0000	0.48
Apr. 15	Apr. 16	Slight.	Slight.	0.2	Dist.vege'ble; unpleasant.	Dist. vegetable,disgreeble	2.85	0.90	1.95	.0000	.0148	.0102	.0046	.37	.0060	.0001	0.63
May 13	May 14	Slight.	Slight.	0.25	Faintly vegetable.	Faintly vegetable.	5 90	0.95	1.95	.0000	.0184	.0152	.0032	.41	.0020	.0000	0.79
June 10	June 12	Slight.	Slight green.	0.30	Decidedly mouldy.	Very faint or none.	3.20	1 40	1.80	.0030	.0260	.0218	.0042	.36	.0050	.0001	0.60
Aug. 12	Aug. 13	Distinct.	Slight.	0.6	None.	None.	3.70	1.35	2.35	.0000	.0226	.0184	.0042	.38	.0030	.0000	0.63
Sept. 10	Sept. 11	Distinct.	Very slight.	0.5	Dist.vege'ble and mouldy	Vegetableand mouldy.				.0000	.0340	.0220	.0120		.0070	.0001	
Oct. 7	Oct. 8	Distinct.	Slight.	0.55	Distinctly vegetable.	Dist. vegetable and grassy				.0004	.0338	.0282	.0056		.0050	.0000	
Nov. 4	Nov. 5	Slight.	Considerable green.	0.7	Decid'lyvegeble,disgreeble	Decid'ly vege ble,disgr'ble.	3.50	1.15	2.35	.0000	.0240	.0190	.0050	.47	.0050	.0000	0.48
Dec. 9	Dec. 10	Decided.	Considerable.	0.8			4.00	2.50	1.50	.0000	.0398	.0308	.0090	.40	.0050	.0001	0.79

ANALYSIS OF WATER IN GLEN LEWIS POND BY STATE BOARD OF HEALTH.

DATE OF		APPEARANCE.			ODOR.		RESIDUE ON EVAPO'TION			AMMONIA.					NITROGEN.		
							Filtered.				Albuminoid.						
Collection.	Examination.	Turbidity.	Sediment.	Color.	Cold.	Hot.	Total.	Loss on Ignition.	Fixed.	Free.	Total.	In Solution.	In Suspension.	Chlorine.	As Nitrates.	As Nitrites.	Hardness.
Jan. 14	Jan. 14									.0024	.1160	.0258	.0902				
Feb. 12	Feb. 13	None.	Very slight.	0.10			3.00	0.80	2.20	.0000	.0064	.0046	.0018	.31	.0050	.0000	0.95
Mar. 10	Mar. 11	Very slight.	None.	0.25			3.30	1.30	2.00	.0010	.0044	.0038	.0006	.41	.0090	.0000	0.63
Apr. 15	Apr. 16	Slight.	Slight.	0.4	Decidedly vegetable.	Strongly veg-ble,disgreeble	3.25	1.50	1.75	.0040	.0314	.0188	.0126	.33	.0200	.0002	0.48
May 13	May 14	Decided.	Slight green.	0.5	Decid'ly veg-ble,disgreeble	Distinctly vegetable.	3.50	1.25	2.25	.0204	.0422	.0284	.0138	.36	.0050	.0001	0.79
June 10	June 12	Decided light green, floc.	Considerable light green.	0.45	Very faintly vegetable.	Grassy.	3.85	2.05	1.80	.0014	.0658	.0346	.0312	.28	.0070	.0001	0.60
Aug. 12	Aug. 13	Distinct.	Considerable dark.	0.7	Stronglygrassy, mouldy.	Strongly veg-ble,sweetish.	5.05	2.60	2.45	.0384	.0438	.0402	.0036	.28	.0050	.0001	0.48
Sept. 10	Sept. 11	Distinct.	Slight brown flocculent.	1.0	Vegetable and sweet.	Vegetableand sweetish.				.0504	.0672	.0544	.0128		.0100	.0003	
Oct. 7	Oct. 8	Distinct.	Heavyreddish brown.	1.4	Dist. vege'ble and grassy.	Dist. veg. disgreeble,peculr				.0198	.0730	.0556	.0174		.0050	.0000	
Nov. 4	Nov. 5	Very slight.	Considerable.	0.1	Dist.vege'ble, unpleasant.	Decid'ly veg-ble,disgreeble	4.35	1.90	2.45	.1060	.0606	.0508	.0098	.41	.0150	.0008	0.32
Dec. 9	Dec. 10	Very slight.	Very slight.	0.85			4.35	2.50	1.85	.0560	.0418	.0360	.0058	.36	.0400	.0003	0.95

ANALYSIS OF WATER IN WALDEN POND BY STATE BOARD OF HEALTH.

DATE OF		APPEARANCE.			ODOR.		RESIDUE ON EVAPO'TION			AMMONIA.				Chlorine.	NITROGEN.		Hardness.
							Filtered.				Albuminoid.						
Collection.	Examination.	Turbidity.	Sediment.	Color.	Cold.	Hot.	Total.	Loss on Ignition.	Fixed.	Free.	Total.	In Solution.	In Suspension.		As Nitrates.	As Nitrites.	
Jan. 14	Jan. 14									.0024	.4400	.1060	.3340				
Feb. 12	Feb. 13	Slight.	Very slight.	0.70			3.25	1.30	1.95	.0134	.0300	.0192	.0108	.26	.0030	.0001	0.63
Mar. 10	Mar. 11	Very slight.	Very slight.	0.45			2.75	1.20	1.55	.0066	.0092	.0076	.0016	.33	.0100	.0001	0.48
Apr. 15	Apr. 16	Slight.	Slight.	0.35	Distinctly vegetable.	Strongly vegeble,disgreeble	3.30	1.35	1.95	.0014	.0284	.0182	.0102	.31	.0250	.0000	0.63
May 13	May 14	Distinct.	Slight.	0.70	Faintly vegetable.	Distinctly vegetable.	3.30	1.45	1.85	.0184	.0388	.0284	.0104	.30	.0020	.0001	0.63
June 10	June 12	Distinct.	Considerable.	0.75	Dist.disgreebl vegebledecay.	Disagreeable.	4.45	2.15	2.30	.0272	.0614	.0398	.0216	.27	.0070	.0000	1.10
July 21	July 22	Distinct.	Considerable.	1.30			4.75	2.75	2.00	.0028	.0652	.0416	.0236	.34	.0150	.0000	0.48
Aug. 12	Aug. 13	Dist. toward the light.	Considerable dark yellow.	1.40	Faintly fishy.	Distinctly fishy.	5.15	2.90	2.25	.0012	.0574	.0412	.0162	.45	.0050	.0000	0.79
Sept. 10	Sept. 11	Distinct.	Considerable green.	1.60	Vegetable.	Vegetableand green corn.				.0000	.0732	.0476	.0256		.0030	.0000	
Oct. 7	Oct. 8	Decided.	Considerable green.	1.80	Decid'lyvegetable,mouldy.	Decid'lyvegetable, mouldy.				.0004	.1612	.0626	.0986		.0070	.0000	
Nov. 4	Nov. 5	Slight.	Considerable.	1.40	Dist. vegeble, unpleasant.	Faintly vegetable.	5.25	2.25	3.00	.0096	.0516	.0460	.0056	.41	.0100	.0003	0.48
Dec. 9	Dec. 10	Distinct.	Slight.	1.20			4.95	2.95	2.00	.0124	.0438	.0382	.0056	.39	.0250	.0002	0.63

TABLE I.

SHOWING THE CONSUMPTION OF WATER FOR THE YEAR ENDING DECEMBER 31, 1891.

MONTH.	Monthly Consumption.	Average Consumption per day.	Average daily increase.	Average daily decrease.	Average to each consumer.	Average to each inhabitant.
	Gallons.	Gallons.	Gallons.	Gallons.	Galls.	Galls.
January . .	89,319,676	2,881,280	8,482		48.50	46 25
February .	80,651,083	2,880,396		884	48.49	46.23
March . .	91.382,553	2,947,824	67,428		49.63	47.32
April . . .	88,513,096	2.950,436	2.612		49.67	47.36
May . . .	92,666,979	2,989,257	38.821		50.32	47.98
June . . .	105,342,217	3,511,407	522,150		59.11	56.36
July . . .	106,699,785	3.441,928		69,479	57.94	55.25
August . .	107,166,112	3,456,971	15 043		58.20	55 49
September .	98,745,131	3.291,504		165,467	55.41	52.83
October . .	97,831,379	3,155,851		135,653	53.13	50.65
November .	90.455,527	3,015,184		140,667	50.76	48.39
December .	94,170,042	3,037,743	22,559		51.14	48.76
Totals and Averages.	1,142,943,580	3,131,352			52.72	50.26

TABLE II.

AMOUNT OF WATER DRAWN FROM EACH SOURCE DURING 1891.

MONTH.	BREED'S.	BIRCH.	CANAL.	Total.
	Gallons.	Gallons.	Gallons.	Gallons.
January .	39,736,390		50,507,936	90,244,326
February	52,538,560		28,293,040	80,831,600
March .	73,106,042		18,276,511	91,382,553
April . .	62,134,742	12,394,062	14,562,509	89,091,313
May . .	17,943,642	7,465,212	64,309,356	89,718,210
June . .	9,446,516	89,955,739	7,334,667	106,736,922
July . .	14,639,610	62,035,055	30,987,187	107,661,852
August .	78,228,524	18,944,622	9,800,147	106,973,293
September	83,600,373	13,941,778		97,542,151
October .	31,811,426	67,233,130		99,044,556
November		75,599,388	12,023,147	87,622,535
December	8,642,235		87,800,588	96,442,829
Total . .	471,828,060	347,568,986	323,895,088	1,143,292,134

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TABLE III.

SHOWING THE RAINFALL AT THE PUMPING STATION FOR 1891.

Day of Month.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1	. . .	. . .	. . .	. . .	. . .	. . .	. . .	0.05	. . .	. . .	. . .	. . .
2	0.32	. . .	. . .	1.65	. . .	0.17	. . .	. . .	. . .	. . .	. . .	. . .
3	0.85	0.85	0.32	0.05	0.12	0.45	0.42	. . .	. . .	. . .	. . .	. . .
4	0.15	. . .	0.93	. . .	. . .	. . .	. . .	. . .	. . .	0.05	. . .	0.19
5	0.16	. . .	. . .	. . .	. . .	. . .	. . .	0.27	0.28	0.02	0.02	. . .
6	. . .	0.18	. . .	. . .	0.02	. . .	. . .	. . .	1.18	. . .	. . .	0.15
7	. . .	0.39	. . .	. . .	. . .	. . .	0.73	0.05	0.54	1.97	. . .	0.19
8	. . .	0.23	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .
9	. . .	0.72	0.75	. . .	. . .	. . .	. . .	. . .	. . .	. . .	0.01	. . .
10	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	0.04	. . .
11	0.82	. . .	. . .	0.22	. . .	. . .	. . .	. . .	. . .	0.05	0.26	. . .
12	. . .	. . .	0.61	. . .	0.12	. . .	. . .	0.02	. . .	. . .	. . .	. . .
13	. . .	. . .	0.39	. . .	. . .	. . .	. . .	. . .	0.30	2.26	. . .	. . .
14	. . .	. . .	. . .	0.33	. . .	. . .	. . .	. . .	. . .	0.03	. . .	. . .
15	. . .	0.02	. . .	. . .	0.88	. . .	0.30	0.52	. . .	0.05	. . .	0.64
16	. . .	0.18	. . .	. . .	0.63	. . .	. . .	. . .	0.06	. . .	0.24	. . .
17	1.34	0.35	. . .	. . .	. . .	0.63	. . .	. . .	. . .	. . .	0.28	. . .
18	0.13	. . .	. . .	0.10	. . .	0.57	0.30	. . .	. . .	. . .	. . .	. . .
19	. . .	. . .	0.06	. . .	. . .	0.11	. . .	. . .	. . .	0.02	. . .	. . .
20	. . .	0.64	0.02	. . .	. . .	. . .	. . .	. . .	. . .	0.75	0.01	. . .
21	. . .	0.36	1.17	. . .	. . .	0.51	. . .	0.43	. . .	. . .	0.01	. . .
22	1.05	. . .	0.15	. . .	0.03	1.35	. . .	. . .	. . .	0.45	0.02	0.12
23	. . .	. . .	0.11	. . .	. . .	. . .	. . .	. . .	. . .	. . .	0.20	0.20
24	0.12	0.41	. . .	. . .	. . .	. . .	0.40	. . .	. . .	. . .	. . .	0.52
25	0.63	. . .	. . .	0.05	. . .	. . .	. . .	. . .	. . .	. . .	. . .	0.01
26	. . .	0.79	. . .	. . .	. . .	. . .	. . .	. . .	. . .	0.18	1.20	0.25
27	0.03	. . .	. . .	. . .	. . .	. . .	. . .	0.22	. . .	0.12	0.02	. . .
28	0.02	. . .	. . .	. . .	0.10	0.03	0.46	0.82	. . .	. . .	. . .	. . .
29	0.30	. . .	. . .	. . .	0.39	0.01	0.09	0.10	0.07	. . .	. . .	1.08
30	. . .	. .	. . .	. . .	. . .	. . .	0.63	0.20	. . .	. . .	. . .	0.06
31	0.50	. . .	. . .	. . .	. . .	. . .	0.05	0.23	. . .	. . .	. . .	. . .
	6.42	5.12	4.51	2.40	2.29	3.83	3.38	2.91	2.43	5.95	2.31	3.41

Rainfall for the year, 44.96.

TABLE IV.

SHOWING THE DEPTH OF WATER IN THE PONDS FOR EACH WEEK DURING 1891.

Date.	Breed's Pond.		Birch Pond.		Walden Pond.		Glen Lewis Pond.		Date.	Breed's Pond.		Birch Pond.		Walden Pond.		Glen Lewis Pond.		Date.	Breed's Pond.		Birch Pond.		Walden Pond.		Glen Lewis Pond.	
	Ft.	In.	Ft.	In.	Ft.	In.	Ft.	In.		Ft.	In.	Ft.	In.	Ft.	In.	Ft.	In.		Ft.	In.	Ft.	In.	Ft.	In.	Ft.	In.
Jan. 1	19	3	15	5	16	5	17	4	May 2	19	9	21	8½	16	3	17	2	Sept. 7	14	7	13	8	11		17	2
" 8	18	6	15	9	16	4	17	4	" 9	19	6	21	7	15	9	17	1½	" 14	13	9	13	8½	11		17	1½
" 15	19		16	3½	16	6	17	4½	" 16	19	5	21	7	15	6	17	1½	" 21	12	11	13	4	10	11½	17	1
" 24	20	4	17	3	17	2½	17	5	" 24	19	4½	21	7	15	4½	17	1½	" 28	11	11	12	7	10	9½	17	1
" 31	20	9	17	8	17	2	17	5	June 1	19	2½	21	6	14	10	17	1	Oct. 3	11	5	12	1	10	8	17	1
Feb. 7	20	10	18	3	17	1	17	4	" 8	19	2½	21	6	14	10	17	1	" 10	10	9	11	9½	10	8	17	1
" 14	20	8	18	7	17		17	2	" 15	19		19	10	14	7	17	1	" 17	10	10	11	3	11		17	2½
" 21	20	10	19	2	17	1	17	4	" 22	19	4	19		14	7	17	2	" 24	11	1½	10	3	11	2	17	2½
" 28	20	10	19	7	17	1	17	4	" 29	19	5	18	7	15		17	1½	" 31	11	3	9	4	11	2½	17	2½
Mar. 7	20	10	19	11	17	1	17	4	July 6	19	4	17	6	14	9	17	1	Nov. 7	11	2	8	2	11	3	17	2
" 14	21	1	20	8	17	1	17	4	" 13	19	3	16	7	14	6	17	1	" 14	11	4	7	11	10	10	17	2
" 21	21		21	1½	17	1	17	4	" 20	19	1	15	6	13	11	17	1	" 21	11	7	8	10	9	5½	17	2
" 28	21		21	7	17	1	17	4	" 27	19		15	5	13	3	17	1	" 28	11	10	9	5½	9	3½	17	2
Apr. 6	21	1	22	1	17		17	4	Aug 3	18	11	15	6	12	6	17	½	Dec. 5	12	1½	9	6	8	5	17	2
" 13	20	10½	22	½	16	9	17	3	" 10	17	10½	14	11	12	3	17	½	" 12	12	8	9	3½	8	1½	17	2
" 20	20	5	21	10½	16	3	17	2½	" 17	17		14	6	12	3	17	½	" 19	12	5½	9	10½	7	11	17	2
" 27	19	11½	21	10	16	3	17	2	" 24	16	1½	14	2	12	1	17	½	" 26	12	10	10	1	7	10	17	2
									" 31	15	7	13	8	12	1	17	½	" 31	13	4	10	6	8	3	17	2½

TABLE V.

SHOWING THE LOCATION OF GATES SET IN 1891.

STREET.	LOCATION.
Allen avenue . .	On W. line Chestnut street, 17 ft. S. of N. line of Allen avenue.
Alley.	On E. line Commercial street, 16 ft. 6 in. S. of N. line of Alley street.
Alley.	On E. line Blossom street, 17 ft. 6 in. N. of S. line of Alley street.
Archer	On E. line Eastern avenue, 13 ft. S. from N. line of Archer street.
Blake.	On E. line Willow street, 16 ft. N. from S. line of Blake street.
Blake.	On W. line Mulberry street, 17 ft. N. from S. line of Blake street.
Boston	On W. line Chestnut street, 17 ft. N. from S. line of Boston street.
Boston	On E. line Collins street, 17 ft. N. from S. line of Boston street.
Boston	30 ft. 8 in. E. of hydrant at Cemetery gate, 16 ft. 2 in. N of S. line of Boston street.
Campbell . . .	On S. line Springvale avenue, 17 ft. W. of E. line of Campbell street.
Chester court . .	On S. line Strawberry avenue, 6 ft. 6 in. N. of S. line of Chester court.
Clark	On E. line Eastern avenue, 17 ft. S. of N. line of Clark street.
Concord . . .	On E. line Walter street, 15 ft. S. of N. line of Concord street.
Cook	On N. line Jefferson street, 13 ft. 6 in. N. of S. line of Cook street.
Crescent . . .	On E. line Chatham street, 10 ft. S. of N. line of Crescent street.
Doyle's court . .	On S. line Western avenue, 14 ft. 6 in. E. of W. line of Doyle's court.
Downing court .	On E. line Shepard street, 5 ft. 4 in. S. from N. line of Downing court.
Dungeon avenue.	1 ft. N. from high service main, 17 in. W. of E. line of Dungeon avenue.
Elizabeth avenue.	On E. line Chatham street, 17 ft. S. of N. line of Elizabeth avenue.
Emerson place .	On S. line Nash street, 4 ft. W. of E. line of Emerson place.

TABLE V.—Continued.

STREET.	LOCATION.
Euclid avenue	On N. line Maple street, 17 ft. E. of W. line of Euclid avenue.
Florence	On N. line Oakwood avenue, 17 ft. W. of E. line of Florence street.
Goldthwait	On S. line Western avenue, 17 ft. E. of W. line of Goldthwait street.
Great Woods road	10 ft. W. of hydrant, 17 ft. N. of S. line of Great Woods road.
Harmon	On W. line Walnut street, 17 ft. S. of N. line of Harmon street.
Herschel	On E. line Eastern avenue, 17 ft. S. of N. line of Herschel street.
Huron	On E. line Michigan avenue, 17 ft. S. of N. line of Huron street.
Light	On N. line Neptune street, 17 ft. W. of E. line of Light street.
Morris	On W. line Cottage street, 16 ft W. of E. line of Morris street.
Morris	On E. line Linden street, 16 ft. W. of E. line of Morris street.
Munroe	On E. line Market street, 17 ft. W. of E. line of Munroe street.
Munroe	On W. line Washington street, 17 ft. W. of E. line of Munroe street.
Nash	On E. line Eastern avenue, 16 ft. W. of E. line of Nash street.
Ocean View ave.	On N. line Oakland street, 7 ft. W. of E. line of Ocean View avenue.
Oakville	On S. line Summer street, 17 ft. W. of E. line of Oakville street.
Perkins	On S. line Harrison street, 17 feet W. of E. line of Perkins street.
Pleasant View ave	On E. line Boylston street, 13 ft. N. of S. line of Pleasant View avenue.
Poplar	On E. line Myrtle street, 13 ft. S. of N. line of Poplar street.
Preston	1 ft. W. of force main, 17 ft. S. of N. line of Preston street.
Ray	On E. line Light street, 16 ft. 6 in. S. of N. line of Ray street.
Reed	On S. line Factory street, 17 ft. E. of W. line of Reed street.

TABLE V.—CONTINUED.

STREET.	LOCATION.
Ridgeway . . .	On S. line Adams street, 12 ft. S. of N. line of Ridgeway street.
Rockdale avenue .	On E. line Euclid avenue, 17 ft. S. of N. line of Rockdale avenue.
Shillington avenue	On W. line of Linwood, 6 ft. S. of N. line of Shillington avenue.
Silsbee avenue .	On E. line Chatham street, 17 ft. N. of S. line of Silsbee avenue.
West Neptune. .	On E. line Light street, 17 ft. S. of N. line of West Neptune street.
South Common .	On E. line Elm street, 17 S. of N. line of South Common street.
South Side avenue	On S. line Boston street, 16 ft. 6 in. W. of E. line of South Side avenue.
Springvale avenue	On W. line Broadway, 16 ft. 4 in. S. of N. line of Springvale avenue.
Thomson . . .	On N. line Boston street, 10 ft. W. of E. line of Thomson street.
Thurston place .	On N. line Essex street, 5 ft. 11 in. W. of E. line of Thurston place.
Varnum	On S line Norton street, 16 ft. 6 in. W. of E. line of Varnum street.
Washington ave.	On W. line Walnut street, 17 feet S. of N. line of Washington avenue.
Washington street	On N. line Union street, 18 ft. 7 in. W. of E. line of Washington street.
Washington street	On S. line Oxford street, 11 ft. 9 in. W. of E. line of Washington street.
Walter	On N. line Webster street, 17 ft. E of W. line of Walter street.
Willow	On N. line Oxford street, 14 ft. 6 in. W. of E. line of Willow street.
Windsor avenue .	On E. line Boylston street, 12 ft. N. of S. line of Windsor avenue.
Wentworth place.	On W. line Euclid avenue, 10 ft. S. of N. line of Wentworth place.

TABLE VI.

SHOWING THE LOCATION OF HYDRANTS SET IN 1891.

STREET.	LOCATION.
Alley	Corner Commercial street.
Alley	396 feet from Commercial street.
Archer	350 feet from Eastern avenue.
Boston	400 feet from Cemetery gate.
Buffum	225 feet S. of Oxford street.
Breed	Opposite Mace place.
Clovelly . . .	363 feet from Western avenue.
Clark	350 feet from Eastern avenue.
Euclid avenue .	475 feet from Maple street.
Euclid avenue .	956 feet from Maple street.
Euclid avenne .	1697 feet from Maple street.
Euclid avenue .	2231 feet from Maple street.
Euclid avenue .	Corner Wentworth place.
Goldthwait . .	363 feet from Western avenue.
Great Woods road	685 feet from Lynnfield street.
Houston place .	106 feet E. from Thomson street.
Huron	Corner Eastern avenue.
Morris	330 feet from Linden street.
Newcomb avenue	Corner Washington avenue.
Newcomb avenue	Corner Garfield avenue.

TABLE VI.—CONTINUED.

STREET.	LOCATION.
Oakville . . .	Corner West Neptune street.
Oxford	225 feet W. from Washington street.
Oxford	Corner Almont street.
Phillips avenue .	145 feet E. from Willow avenue.
Park avenue . .	Corner Springfield avenue.
Paradise road . .	469 feet N. from Quebec street.
Pleasant View ave.	307 feet E. from Boylston street.
Preston	133 feet E. from Perkins street.
Quebec	Corner Dungeon avenue.
Quebec	100 feet W. from Paradise road.
Reed	Corner Factory street.
Rockdale avenue .	310 feet E. from Euclid avenue.
Rockdale avenue .	607 feet E. from Euclid avenue.
Springvale avenue	Corner Campbell street.
South	185 feet S. from Western avenue.
Southside avenue	591 feet S. from Boston street.
Varnum	95 feet S from Ray street.
Walnut	389 feet S. from Washington avenue.
Washington ave .	Corner Walnut street.
Washington ave .	Corner Garfield avenue.
Washington . .	Near Boston & Maine R. R.

TABLE VI.—Continued.

STREET.	LOCATION.
Washington . .	Corner Cleveland avenue.
Waterford . . .	300 feet N. from Woodman street.
Wentworth place.	584 feet N. from Euclid avenue.
Windsor avenue .	533 feet E. from Boylston street.
Willow	Corner Barker's court.
Willow	150 feet S. from Oxford street.

TABLE VII.

SHOWING THE LEAKS IN PIPES AND HYDRANTS, 1891.

MONTH.	SIZE OF MAINS.						Hydrants.
	16 in.	12 in.	10 in.	8 in.	6 in.	4 in.	
January	...	...	...	...	...	1	3
February	...	...	...	...	...	2	...
March	...	...	...	...	3	...	...
April	...	...	...	...	9	4	2
May	...	...	1	...	8	4	1
June	...	...	...	2	5	6	3
July	...	...	1	1	2	6	1
August	1	1	1	...	5	9	1
September	...	...	...	2	1	6	4
October	1	...	1	1	2	7	4
November	...	...	...	2	7	4	2
December	1	...	...	...	1	6	1
Totals	3	1	4	8	43	55	22

TABLE VIII.

SHOWING THE KIND, SIZE AND NUMBER OF METERS IN USE IN 1891.

KIND.	4	3	2	1½	1¼	1	¾	⅝	½	Tot.
Worthington	. . .	1	14	2	3	41	38	18	. . .	117
Ball & Fitts	. . .	. . .	. . .	1	. . .	20	56	40	. . .	117
Thomson	1	. . .	. . .	3	. . .	32	38	24	. . .	98
Union	8	. . .	4	5	. . .	15	10	. . .	. . .	42
Crown	. . .	. . .	. . .	2	. . .	6	13	. . .	1	22
Niagara	. . .	. . .	. . .	. . .	. . .	4	. . .	. . .	. . .	4
Weir	. . .	. . .	. . .	. . .	. . .	2	1	. . .	1	4
Empire	. . .	. . .	2	. . .	. . .	. . .	. . .	. . .	. . .	2
Gem	. . .	. . .	1	. . .	. . .	. . .	. . .	. . .	. . .	1
Hersey	. . .	. . .	. . .	. . .	. . .	. . .	1	. . .	. . .	1
Nash	. . .	. . .	. . .	. . .	. . .	. . .	1	. . .	. . .	1
Frost	. . .	. . .	. . .	. . .	. . .	. . .	1	. . .	. . .	1
Motors	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	3
Totals	9	1	21	13	3	120	159	82	2	413

Total gallons metered, 149,275,000.

TABLE IX.

SHOWING THE NUMBER, SIZE AND LENGTH OF SERVICES LAID IN 1891.

MONTH.	SIZE AND LENGTH OF PIPE.														TOTAL.	
	6 in.		4 in.		2 in.		1½ in.		1¼ in.		1 in.		¾ in.			
	No.	Feet.	No.	Feet.	No.	Feet.	No.	Feet.	No.	Feet.	No.	Feet.	No.	Feet.	No.	Feet.
January . .	. . .	. . . . .	1	39.2	. . .	. . . . .	. . .	. . . . .	. . .	. . . . .	1	22.0	. . .	. . . . .	2	61.2
March. . .	. . .	. . . . .	1	21.8	. . .	. . . . .	. . .	. . . . .	1	23.3	6	225.8	. . .	. . . . .	8	270.7
April . . .	. . .	. . . . .	1	14.0	. . .	. . . . .	1	29.10	1	380	25	1,144.3	25	961.4	53	2,529.5
May. . . .	1	98	1	64	. . .	. . . . .	. . .	. . . . .	1	279.11	22	1,094.9	43	1,687.6	68	3,224.2
June. . . .	. . .	. . . . .	1	116.6	4	118.2	. . .	. . . . .	. . .	. . . . .	34	2,396.5	30	1,282.7	69	3,913.8
July. . . .	. . .	. . . . .	2	173.8	2	69	. . .	. . . . .	2	322.9	26	1,634.11	30	891.6	62	3,091.10
August . .	. . .	. . . . .	1	25.6	. . .	. . . . .	1	30.6	2	52.4	35	1,894.10	24	828.11	63	2,832.1
September.	. . .	. . . . .	2	35.2	1	63.0	. . .	. . . . .	1	68.3	21	1,134.10	41	1,464	66	2,765.3
October . .	1	38.3	1	34.6	. . .	. . . . .	. . .	. . . . .	2	40.9	18	1,043.5	50	1,656.4	72	2,813.3
November.	3	93	. .	. . . . .	. . .	. . . . .	. . .	. . . . .	. . .	. . . . .	42	1.848.1	38	1,274.8	83	3,215.9
December .	1	63.6	1	21	2	102	1	36.10	2	108	21	1,025.2	23	880.5	51	2,236.11
Totals .	6	292.9	12	545.2	9	352.2	3	97.2	12	1,275.3	251	13.464.4	304	10,927.3	597	26,954.1

Total services now in use, 9,678. Total length, 76 miles, 3,998 feet.
Services in Saugus, 348. Length, 3 miles, 2,525 feet.

TABLE X.

SHOWING THE AMOUNT AND SIZE OF CAST IRON PIPE LAID IN 1891.

STREETS WHERE LAID.			SIZE OF PIPE.					
Street.	From.	To.	16 in.	12 in.	10 in.	8 in.	6 in.	4 in.
Almont	Union	Oxford	. . .	. . .	. . .	. . .	*575	. . .
Alley	End of pipe . .	Commercial . . .	. . .	. . .	. . .	. . .	478	. . .
Alley	Blossom . . .	Pleasant st court	. . .	. . .	. . .	. . .	. . .	145
Allen avenue .	Chestnut . . .	Morrill	. . .	. . .	. . .	. . .	247	. . .
Archer	Eastern avenue	North	. . .	. . .	. . .	. . .	378	. . .
Averill	End of pipe . .	West	. . .	. . .	. . .	. . .	. . .	118
Bay View ave.	. . . .	. . . .	. . .	†96	. . .	. . .	. .	. . .
Blake	Central avenue	Mulberry	. . .	. . .	. . .	. . .	372	. . .
Boylston . . .	Pl'sant View av	Windsor avenue.	. . .	. . .	. . .	. . .	278	. . .
Buffum	Union	Oxford	. . .	. . .	. . .	*594	*8	. . .
Boston	Cemetery gate.	Chestnut	. . .	. . .	. . .	2,330	11	. . .
Clark	Eastern avenue	North	. . .	. . .	. . .	. . .	672	. . .
Cleveland ave	Washington av.	West	. . .	. . .	. . .	. . .	110	. . .
Chippewa court	Lewis	West	. . .	. . .	. . .	. . .	. . .	*530
Concord	Walter	. . . .	. . .	. . .	. . .	. . .	. . .	352
Clovelly	End of pipe . .	East	. . .	. . .	. . .	. . .	188	. . .
Crescent . . .	Chatham . . .	North	. . .	. . .	. . .	. . .	. . .	317
Campbell . . .	Springvale . .	East	. . .	. . .	. . .	. . .	. . .	207
Dungeon ave .	High serv. main	Quebec	. . .	. . .	. . .	. . .	1,231	. . .
Elizabeth ave .	Chatham . . .	North	. . .	. . .	. . .	. . .	. . .	254
Euclid avenue.	Maple	Rockdale avenue	. . .	. . .	. . .	. . .	3,499	. . .
Florence . . .	Oakwood ave .	North	. . .	. . .	. . .	. . .	. . .	334
Great Woods rd.	End of pipe . .	Park	. . .	. . .	. . .	. . .	. . .	*320 262
Garfield avenue	Washington av.	Newcomb avenue	. . .	. . .	. . .	. . .	. . .	426
Grover	Hamilton ave .	High Rock . . .	. . .	. . .	. . .	. . .	. . .	417

TABLE X.—Continued.

STREETS WHERE LAID.			SIZE OF PIPE.					
Street.	From.	To.	16 in.	12 in.	10 in.	8 in.	6 in.	4 in.
Grant	End of pipe	North	...	...	...	97	...	...
Goldthwait	Western avenue	End of street	...	...	...	...	817	70
Hancock	Winthrop	North	...	...	...	...	164	...
Harmon	Walnut	South	...	...	...	...	320	...
Harrison ave	Washington av.	East	...	...	...	...	...	317
Herschel	Eastern avenue	East	...	...	...	...	144	...
Hutchinson ct.	End of pipe	South	...	...	...	...	...	342
Houston ct	....	....	...	...	...	...	...	273
Huron	Eastern avenue	Michigan avenue	...	...	...	...	495	...
Hurd	Quebec	South	...	...	...	...	...	294
Keene	Euclid avenue.	East	...	...	...	...	...	276
Locust	End of pipe	South	...	...	...	...	195	...
Morrill	Allen avenue	East	...	...	...	...	...	145
Morris	Cottage	Linden	...	...	...	...	...	682
Munroe	Washington	Market	...	...	*750	...	...	...
Mulberry	Union	Oxford	...	...	...	...	*554	...
Nash	Eastern avenue	North	...	...	...	...	305	...
Newcomb ave	Washington av.	Garfield avenue	...	...	...	...	513	...
Norton	End of pipe	Varnum	...	...	...	...	...	65
Oakville	Summer	West Neptune	...	...	...	...	757	36
Oxford	Market	Buffum	...	...	...	*13,11	*24	...
Phillips avenue	End of pipe	Hydrant	...	...	...	...	...	370
Park avenue	End of pipe	Springfield ave	...	...	...	...	325	...
Paradise road	Quebec	Park	...	...	...	...	907	...
Perkins	Harrison	Preston	...	...	...	...	443	...
Pl'sant View av	Boylston	East	...	...	...	...	...	317
Poplar	Myrtle	Walnut	...	...	...	...	...	363

TABLE X.—CONTINUED.

STREETS WHERE LAID.			SIZE OF PIPE.					
Street.	From.	To.	16 in.	12 in.	10 in.	8 in.	6 in.	4 in.
Preston	Perkins	North	. . .	. . .	. . .	. . .	258	. . .
President . . .	End of pipe . .	North	. . .	. . .	. . .	. . .	145	. . .
Quebec	Dungeon ave .	Paradise road . .	. . .	. . .	. . .	. . .	704	. . .
Ray	Light	Varnum	. . .	. . .	. . .	. . .	. . .	347
Rockdale ave .	Euclid avenue.	North	. . .	. . .	. . .	. . .	. . .	754
Ridgeway . . .	Adams	End of pipe . . .	. . .	. . .	. . .	. . .	. . .	*332
Reservoir road	Stiles	West	. . .	. . .	. . .	. . .	132	. . .
Reed	Factory	South	. . .	. . .	. . .	. . .	. . .	655
Silsbee avenue	Chatham . . .	East†	. . .	. . .	. . .	. . .	271	. . .
Springvale ave.	Broadway . . .	Cemetery	. . .	. . .	. . .	. . .	. . .	998
South Side ave.	Boston	End of avenue .	. . .	. . .	. . .	. . .	. . .	632
Stiles	End of pipe . .	Reservoir road .	. . .	. . .	. . .	. . .	. . .	36
South Common	Elm	End of Common.	. . .	. . .	. . .	. . .	*382	. . .
Thomson . . .	Boston	Houston	. . .	. . .	. . .	. . .	307	. . .
Varnum	Norton	End of street . .	. . .	. . .	. . .	. . .	. . .	482
Varnum court .	Varnum	End of court . .	. . .	. . .	. . .	. . .	. . .	124
Walter	Webster . . .	North	. . .	. . .	. . .	. . .	255	. . .
Washington . .	Oxford	Union	. . .	. . .	*724	. . .	*30	. . .
Washington av.	Walnut	Cleveland avenue	. . .	. . .	. . .	. . .	1,154	. . .
Walnut	End of pipe . .	Washington ave.	. . .	. . .	. . .	. . .	776	. . .
Waterford . .	Woodman . . .	West	. . .	. . .	. . .	. . .	. . .	324
Willow	Blake	Liberty	. . .	. . .	. . .	*792	*49	. . .
Windsor ave .	Boylston . . .	North	. . .	. . .	. . .	. . .	. . .	555
Wentworth pl .	Euclid avenue .	South	. . .	. . .	. . .	. . .	. . .	584
West Neptune	End of pipe . .	End of street . .	. . .	. . .	. . .	. . .	. . .	115
Woodlawn . .	End of pipe . .	North	. . .	. . .	. . .	. . .	173	. . .
Woodlawn . .	Tapley	South	. . .	. . .	. . .	. . .	. . .	132
Waitt's court .	President . . .	East	. . .	. . .	. . .	. . .	. . .	397
Totals				96	1,474	5,124	18,646	13,690

* Re-laid. † Lowered.

TABLE XI.

SHOWING THE AMOUNT AND SIZE OF CEMENT-LINED PIPE LAID IN 1891.

STREETS WHERE LAID.			SIZE OF PIPE.	
Street.	From.	To.	2 in.	1½ in.
Cook	Jefferson	End of pipe	164	. . . .
Doyle's court	Western avenue	South	. . . .	221
Downing court	Shepard	East	207	. . . .
Emerson	Nash	East	315	. . . .
Great Woods road	End of 4-in. pipe	West	1,302	. . . .
Ocean View avenue	Oakland	West	151	. . . .
Shillington avenue	Linwood	West	290	. . . .
Chester court	Strawberry avenue	East	244	. . . .
Thurston place	Essex	North	286	. . . .
Totals			2,959	221

	MILES.	FEET.
Total pipe laid in 1891	7	5,259
Cement pipe taken up and replaced with cast iron	1	1,385
Total extension	6	3,874
Previously laid	91	5,059
Laid to January 1, 1892	98	3,653
Private pipe in Swampscott		1,778
Pipe in Saugus	10	1,832
Total supplied by the works	109	1,983

TABLE XII.

RECORD OF THE LEAVITT ENGINE FOR THE YEAR ENDING DECEMBER 31, 1891.

DATE.	Number of pumping days.	Total pumping time per month.	Average pumping time per day.	Number of revolutions per month.	Average revolutions per minute.	COAL CONSUMED.				Ashes.	Ashes.	Gallons pumped per month allowing 4 per cent. for loss of action in pump.	Average number of gals. pumped per lb. of coal.	Average number of gallons raised 100 feet high per lb. of coal.	Average head against the pump.	Average duty in lbs. of water raised 1 foot high per 100 lbs. of coal, no deduction for ashes.	Average duty in lbs. of water raised 1 foot high per 100 lbs. of coal, the ashes deducted.	Oil.	Waste.
						Raising Steam.	Pumping.	Banking.	Total.										
Month.	Days	H.M.	H.M.	Rev.	Rev.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Perct.	Gals.	Gals.	Gals.	Feet.	Lbs.	Lbs.	Gals.	Lbs.
January . .	18	290.55	16.14	316,050	18.11	3,000	84,500	2,300	89,800	9,600	10.69	58,959,127	656	1,116.64	170.22	93,207,604	104,364,624	16	36
September .	9	143	17	149,200	16.25	1,900	33,350	1,200	36,450	2,814	7.72	27,833,260	763	1,299.62	170 33	108,473,521	117,548,456	5	10
October . .	12	213.05	17.75	228,650	17.88	2,000	51,900	1,200	55,100	4,955	8.99	42,654,657	774	1,248.85	161.35	104,171,729	114,465,296	10	10
November .	24	439	18.29	469 700	17.83	4,200	107,200	1,800	113,200	12,515	11.55	87,622,535	774	1,251.16	161.35	104,354,491	117,325,504	20	50
December .	22	408.30	18 55	436,550	17.81	3,000	99,800	1,800	104,600	8,750	8.36	81,438,403	778.5	1,276.04	163.91	106,431,226	116,147,169	11	30
Totals and Averages.	85	1,494.30	17.28	1,600,150	17.57	14,100	376,750	8,300	399,150	38,634	9.68	298,507,982	747.86	1,237.63	164.92	102,863,001	113,886,116	62	136

TABLE XIII.

COST OF PUMPING WITH THE LEAVITT ENGINE FOR THE YEAR 1891.

89,800 pounds of coal at $4.75 and 309,350 pounds at $4.50 per ton (2,000)	$909 27
Repairs on engine and boilers	102 40
Oil, packing, waste, etc	118 36
Sundry small stores	58 83
Insurance	15 00
Wages of engineers and firemen	1,174 65
Kem Kom	20 00
Lighting	49 34
Telegraphing	15 31
	$2,463 16

Cost of raising 1,000,000 gallons into the reservoir	$8 25
Cost of raising 1,000,000 gallons one foot high dynamic	0.05.00

TABLE XIV.

RECORD OF THE LORETZ ENGINE FOR THE YEAR ENDING DECEMBER 31, 1891.

DATE.	Number of pumping days.	Total pumping time per month.	Average pumping time per day.	Number of revolutions per month.	Average revolutions per minute.	COAL CONSUMED.				Ashes.	Ashes.	Gallons pumped per month allowing 4 per cent. for loss of action in pump.	Average number of gals. pumped per lb. of coal.	Average number of gallons raised 100 feet high per lb. of coal.	Average head against the pump.	Average duty in lbs. of water raised 1 foot high per 100 lbs. of coal, no deduction for ashes.	Average duty in lbs. of water raised 1 foot high per 100 lbs. of coal, the ashes deducted.	Oil.	Waste.
						Raising Steam.	Pumping.	Banking.	Total.										
Month.	Days	H. M.	H. M.	Rev.	Rev.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Per ct	Gals.	Gals.	Gals.	Feet.	Lbs.	Lbs.	Gals	Lbs.
January . .	8	118.40	14.80	168,200	23.62	2,000	46,900	1,800	50,700	4,900	9.66	31,285,200	617	944.50	153.08	78,505,680	87,210,436	9	13
February .	22	269.30	12.24	419,400	25.93	5,600	112,750	5,000	123,350	12,680	10.28	80,831,600	655.3	1,029.94	157.17	85,895,582	95,740,039	20	25
March . .	26	285.55	10.98	453,050	26.41	7,100	122,950	6,600	136,650	13,140	9.62	91,382,553	668.7	1,052.06	157.33	87,749,077	97,084,539	30	20
April . . .	25	269.55	10.78	433,450	26.74	7,100	115,200	6,300	128,600	14,500	11.27	89,091,313	692	1,091.97	157.80	91,173,250	102,759,685	25	40
May	26	286.20	11.01	436,500	26.33	6,700	117,250	6,300	130,250	13,000	9.98	89,718,210	688	1,084.98	157.70	90,594,245	100,638,809	30	25
June	27	328.35	12.16	519,300	26.44	7,300	138,850	6,600	152,750	14,180	9.28	106,736,922	698	1,100.74	157.70	91,905,185	101,309,930	60	52
July	27	324.55	12.02	523,800	26.87	8,300	138,300	7,200	153,800	14,520	9.21	107,661,852	700	1,103.90	157.70	92,069,383	101,659,372	60	50
August . .	26	317.25	12.20	520,450	27.32	8,300	142,150	7,500	157,950	15,070	9.54	106,973,293	677	1,067.63	157.70	89,076,007	98,471,132	46	50
September .	17	212.40	12.50	339,150	26.58	4,800	92,850	4,800	102,450	11,256	10.98	69,708,890	684	1,078.67	157.70	89,491,381	100,537,228	36	60
October . .	15	166.25	11.08	274,350	27.40	4,700	74,000	4,400	83,100	9,875	11.88	56,389,899	678.5	1,061.51	156.45	88,540,487	100,480,908	29	25
December .	3	42.05	14.01	73,000	28.91	2,200	18,200	600	21,000	1,370	6.52	15,004,420	714.5	1,104.69	154.61	92,130,525	98,560,419	11	30
Totals and Averages.	222	2,620.25	12.16	4,160,650	26.59	64,100	1,119,400	57,100	1,240,600	124,491	10.03	844,784,152	680.95	1,067.80	157.03	89,179,013	99,126,056	356	390

TABLE XV.

COST OF PUMPING WITH THE L. LORETZ ENGINE FOR THE YEAR 1891.

569,550 pounds of coal at $4.75 and 671,050 pounds at $4.50 per ton (2,000)	$2,862 10
Repairs on engine and boilers	308 14
Oil, packing, waste, etc	679 60
Sundry small stores	153 65
Insurance	15 00
Wages of engineers and firemen	3,067 92
Lighting	128 86
Telegraphing	39 99
	$7,255 26

Cost of raising 1,000,000 gallons into the reservoir	$8 59
Cost of raising 1,000,000 gallons one foot high dynamic	0.05.48

Meteorological Record for January, 1891.

	8 A. M.		1 P. M.		6 P. M.		24 HOURS ENDING 8 A. M.				
Date.	Barometer.	Thermometer.	Barometer.	Thermometer.	Barometer.	Thermometer.	Maximum Thermometer.	Minimum Thermometer.	Daily Range.	Daily Mean.	Rainfall.
1	30.20	20.0°	30.15	28.5°	30.34	26.0°	38.0°	20.0°	18.0°	29.00°	0.34
2	29.57	38.0	29.41	42.0	29.38	36.5	43.0	29.0	14.0	36.00	1.03
3	29.69	29.0	29.83	29.5	29.96	21.0	30.0	10.5	19.5	20.25	....
4	30.22	12.5	30.23	23.5	30.20	21.5	24.0	12.0	12.0	18.00	*0.14
5	29.94	24.0	29.85	23.5	29.85	20.0	24.0	18.0	6.0	21.00	*0.08
6	29.86	20.5	29.87	25.0	29.88	19.0	26.0	18.0	8.0	22.00	....
7	29.89	18.0	29.92	30.0	29.94	23.5	31.0	15.0	16.0	23.00	....
8	30.22	17.0	30.30	29.0	30.54	23.5	29.0	10.0	19.0	19.50	....
9	30.45	11.5	30.47	29.0	30.41	23.0	29.0	12.0	17.0	20.50	....
10	30.24	16.5	30.22	32.0	30.20	27.5	32.0	17.0	15.0	24.50	....
11	30.08	25.5	29.94	30.5	29.70	36.0	43.5	25.5	18.0	34.50	0.84
12	28.80	39.5	28.93	36.5	29.20	31.0	40.5	18.5	22.0	29.50	....
13	29.60	18.5	29.69	22.5	29.78	16.0	24.0	12.0	12.0	18.00	....
14	29.82	24.0	29.76	33.0	29.75	29.5	34.0	17.0	17.0	25.50	*0.01
15	30.30	18.0	30.37	26.5	30.36	26.0	28.0	18.0	10.0	23.00	....
16	30.38	24.0	30.45	27.0	30.53	21.0	29.0	14.0	15.0	21.50	....
17	30.51	17.0	30.36	23.5	30.24	28.0	30.0	17.5	12.5	23.75	1.33
18	29.83	31.0	29.84	32.5	29.00	29.9	32.0	22.0	10.0	27.00	0.06
19	30.05	22.5	30.04	26.5	30.05	23.0	28.0	20.0	8.0	24.00	....
20	29.98	22.0	29.97	32.0	29.96	26.0	33.5	20.5	13.0	27.00	....
21	30.01	26.0	30.04	37.0	30.03	34.0	37.0	26.0	11.0	31.50	0.13
22	28.90	37.0	29.64	43.0	29.44	44.0	47.0	32.0	15.0	39.50	0.79
23	29.79	32.0	29.88	39.0	30.00	34.0	40.5	26.5	14.0	33.50	....
24	30.15	27.5	30.16	38.5	30.14	35.0	38.0	28.5	9.5	33.25	0.18
25	29.50	32.0	29.52	31.5	29.80	28.0	34.0	21.0	13.0	27.50	0.35
26	29.96	23.0	29.98	37.0	29.97	31.5	37.5	22.5	15.0	30.00	....
27	30.05	27.5	30.09	27.0	30.10	24.0	29.5	23.5	6.0	26.50	0.01
28	30.17	23.0	30.25	37.0	30.26	33.0	37.5	23.0	14.5	30.25	....
29	30.24	32.0	30.12	34.0	29.96	35.0	35.0	32.0	13.0	33.50	0.33
30	29.62	35.0	29.67	42.5	29.76	36.0	44.0	26.5	17.5	35.25	....
31	30.17	26.5	30.18	37.0	30.14	33.0	37.0	28.0	9.0	32.50	0.40

Monthly range . . . . 37.0°
Monthly mean . . . . 27.44°
Monthly rainfall 6.02

* Snow.

Meteorological Record for February, 1891.

	8 A. M.		1 P. M.		6 P. M.		24 HOURS ENDING 8 A. M.				
Date.	Barometer.	Thermometer.	Barometer.	Thermometer.	Barometer.	Thermometer.	Maximum Thermometer.	Minimum Thermometer.	Daily Range.	Daily Mean.	Rainfall.
1	29.62	36.0°	29.63	44.5°	29.70	38.5°	44.5°	32.5°	12.0°	38.50°	....
2	30.06	32.5	30.20	38.5	30.25	30.5	39.0	24.0	15.0	31.50	....
3	29.96	33.0	29.63	37.0	29.33	42.5	43.5	17.0	26.5	30.25	0.48
4	29.77	18.5	29.89	24.0	30.06	13.5	24.0	00.0	24.0	12.00	....
5	30.57	5.0	30.57	18.5	30.48	20.0	30.0	5.0	25.0	17.50	....
6	30.24	30.0	30.02	37.0	30.00	34.0	39.0	23.5	15.5	31.25	....
7	30.06	27.5	30.05	37.0	30.00	33.5	38.0	28.0	10.0	33.00	0.43
8	29.96	30.0	30.02	28.0	30.23	21.5	30.0	13.5	16.5	21.75	0.12
9	30.42	22.0	30.39	27.0	30.22	30.0	34.0	22.0	12.0	28.00	0.72
10	29.59	32.0	29.63	39.0	29.70	31.0	40.0	18.0	22.0	29.00	....
11	30.09	22.0	30.15	28.0	30.23	23.0	28.0	13.5	14.5	20.75	....
12	30.33	19.0	30.27	30.0	30.18	30.0	34.0	20.0	14.0	27.00	....
13	30.04	25.5	30.03	37.0	30.01	30.0	38.0	12.0	26.0	25.00	....
14	30.30	14.0	30.40	18.5	30.48	11.5	21.0	2.5	18.5	11.75	....
15	30.61	7.5	30.56	21.0	30.42	24.0	40.0	6.0	34.0	23.00	....
16	29.83	40.0	29.70	45.0	29.68	41.5	45.0	38.0	7.0	41.50	0.20
17	29.57	40.0	29.65	36.5	29.72	33.0	47.0	32.5	14.0	39.75	0.34
18	29.54	35.0	29.59	41.5	29.76	33.0	44.0	18.0	26.0	31.00	....
19	30.39	22.0	30.45	27.0	30.45	24.0	29.5	16.5	13.0	23.00	....
20	30.49	25.5	30.43	27.0	30.34	25.0	34.0	25.0	9.0	29.50	0.48
21	29.85	34.0	29.72	35.5	29.66	34.0	36.0	33.0	3.0	34.50	0.33
22	29.71	34.0	29.75	37.0	29.95	27.5	41.0	19.0	22.0	30.00	....
23	30.51	20.5	30.54	25.5	30.52	23.5	31.5	20.0	11.5	25.75	....
24	30.43	31.5	30.32	44.0	30.22	40.0	47.0	32.0	15.0	39.50	0.33
25	29.84	44.5	29.66	54.0	29.54	48.0	55.5	42.5	13.0	49.00	....
26	29.51	42.5	29.50	41.0	29.48	35.0	46.0	25.0	21.0	35.50	0.72
27	29.49	26.0	29.70	31.5	29.90	24.0	33.0	11.0	22.0	22.00	....
28	30.44	19.0	30.40	32.5	30.34	31.0	35.0	12.0	23.0	23.50	....

Monthly range . . . . 55.5°
Monthly mean . . . . 28.74°
Monthly rainfall 4.15

Meteorological Record for March, 1891.

	8 A. M.		1 P. M.		6 P. M.		24 HOURS ENDING 8 A. M.				
Date.	Barometer.	Thermometer.	Barometer.	Thermometer.	Barometer.	Thermometer.	Maximum Thermometer.	Minimum Thermometer.	Daily Range.	Daily Mean.	Rainfall.
1	30.37	24.0°	30 37	28.5°	30.42	14.5°	28 0°	1.0°	27.0°	14.50°	....
2	30.50	8.5	30.51	15.0	30.48	14.0	17.0	8.0	9.0	12.50	....
3	30.46	17.0	30.40	26.5	30.39	26.0	32.0	17.0	15.0	24.50	0.26
4	29 91	29.0	29.78	31.5	29.68	30.0	32.0	15.0	17.0	23.50	0.57
5	29.83	23 0	29 83	31.5	29.87	24.0	32.5	15.0	17.5	23.75	....
6	29.99	21.5	29.97	29 0	29.97	28 0	30 0	22.0	8.0	26.00	....
7	30.05	30.0	30.05	34.0	30.00	33.0	41.5	20.5	21.0	31.00	....
8	30.09	28.0	30 09	34.5	30 10	33.0	37.5	28.5	9 0	33.00	....
9	30.20	35.0	30.20	38.0	30.13	34.0	42 5	34.5	8.0	38.50	0.69
10	29 93	35.5	30.06	37.5	30.15	34.0	37.5	22 5	15.0	30.00	....
11	30.42	34.5	30.44	35.5	30 42	34 5	37.0	30 0	7 0	33.50	....
12	30.38	37.0	30.33	42 0	30.27	36 0	42.0	35 0	7.0	38 50	0.65
13	29.86	38 5	29.62	42 5	29.47	43.0	47.0	29.0	8 0	38.00	0.16
14	29.61	33 0	29.66	35.5	29 72	29.5	35.0	20 0	15.0	27.50	....
15	30.16	26 5	30.22	29.0	30.22	26.0	34.0	25.0	9.0	29.50	....
16	29 98	34.0	29.83	43 0	29 85	31.0	44.0	13.0	31.0	28.50	....
17	30.16	19 0	30 19	24.0	30.19	23.0	31.0	18 0	13.0	24 50	....
18	30.15	31.0	30.03	42.0	29.94	37.5	45.0	31.0	14.0	38.00	....
19	30.10	32.0	30.23	31.0	30.28	29.0	35.0	26.0	9.0	30.50	0 05
20	30.36	32.0	30 37	33 0	30.34	31.0	36.0	31.0	5 0	33.50	....
21	30.16	32.0	30.02	33 0	29.88	36 0	40.0	33.0	7 0	36.50	1.14
22	29 78	40.0	29.80	45.0	29.83	42.5	46 0	40.0	6.0	43.00	0 08
23	29,98	44 0	30.06	42.0	30.11	38.0	44 0	34.0	10.0	39 00	0.01
24	30.18	36.0	30.19	44.0	30.16	38.5	45.0	34.0	11.0	39 50	....
25	30.07	37.0	30.08	40.5	30.08	35.0	42.0	23.0	19.0	32.50	....
26	30 28	30.0	30 32	33 0	30.31	31.0	34.0	20.0	14.0	27 00	....
27	30 34	34 0	30.27	38 5	30.16	33 0	39.5	27 5	12.0	33.50	....
28	29.95	39.5	29.91	38.5	29 86	34.0	43.0	35.0	8 0	39.00	....
29	29.87	43.0	29.88	46 0	29 90	41.0	47.5	31.5	16 0	39.50	....
30	30.03	41.5	30.02	38.0	30.04	34.0	45 0	26.0	19.0	35.50	....
31	30 14	37.5	30.12	35.0	30.10	32.0	38 5	28 5	10 0	33.50	....

Monthly range . . . . 46.5°
Monthly mean . . . . 31.22°
Monthly rainfall 3.61

Meteorological Record for April, 1891.

	8 A. M.		1 P. M.		6 P. M.		24 HOURS ENDING 8 A. M.				
Date.	Barometer.	Thermometer.	Barometer.	Thermometer.	Barometer.	Thermometer.	Maximum Thermometer.	Minimum Thermometer.	Daily Range.	Daily Mean.	Rainfall.
1	30.08	36.0°	30.11	39.0°	30.12	34.0°	42.0°	29.0°	13.0°	35.50°	....
2	30.12	37.0	30.08	38.5	30.02	35.0	41.0	34.0	7.0	37.50	1.45
3	29.08	40.0	28.98	37.5	29.22	36.0	41.0	30.0	11.0	35.50	0.04
4	29.44	40.0	29.50	41.0	29.54	38.0	44.0	26.0	18.0	35.00	....
5	29.76	36.0	29.79	37.0	29.84	32.0	37.0	24.0	13.0	30.50	....
6	29.86	37.0	29.82	38.0	29.75	34.0	42.5	25.5	17.0	34.00	....
7	29.77	39.0	29.78	42.0	29.84	35.0	42.5	30.0	12.5	36.25	....
8	30.05	38.5	30.08	46.0	30.11	39.0	47.0	27.0	20.0	37.00	....
9	30.36	41.0	30.40	39.0	30.44	37.0	46.5	28.5	18.0	37.50	....
10	30.54	46.5	30.55	46.0	30.52	43.0	50.0	36.0	14.0	43.00	....
11	30.44	41.0	30.38	45.0	30.28	41.0	50.0	41.5	8.5	45.75	0.17
12	29.90	48.0	29.89	56.5	29.89	48.0	57.5	38.0	19.5	47.75	....
13	29.98	53.5	30.00	58.0	30.01	55.0	60.0	42.0	18.0	51.00	....
14	30.06	58.0	30.02	72.0	30.00	60.0	72.0	40.0	32.0	56.00	0.33
15	30.06	40.0	30.07	40.0	30.09	37.0	42.0	36.0	6.0	39.00	....
16	30.15	40.0	30.14	44.5	30.12	42.0	53.0	39.0	14.0	46.00	....
17	30.25	53.0	30.27	48.0	30.22	45.0	55.0	41.0	14.0	48.00	....
18	30.11	53.0	29.97	64.0	29.84	62.0	69.5	54.0	15.5	61.75	0.10
19	29.88	68.0	29.84	72.0	29.84	65.0	73.5	49.5	24.5	61.50	0.01
20	30.05	58.5	30.10	51.0	30.16	43.0	62.0	37.0	25.0	69.50	....
21	30.35	53.0	30.30	54.0	30.20	54.0	61.0	43.0	18.0	52.00	....
22	29.98	61.0	29.82	68.0	29.68	68.0	72.0	57.0	15.0	64.50	....
23	29.52	63.0	29.46	72.0	29.44	67.0	72.0	40.0	32.0	56.00	....
24	29.57	42.0	29.55	44.0	29.50	45.0	50.5	33.5	17.0	42.00	....
25	29.52	37.5	29.53	44.0	29.61	39.0	49.0	32.5	16.5	40.75	0.03
26	29.86	49.5	29.88	50.0	29.90	47.0	60.0	36.0	24.0	48.00	....
27	29.92	60.0	29.86	62.0	29.76	57.0	67.0	51.0	16.0	59.00	....
28	29.68	67.0	29.68	68.0	29.71	54.0	68.0	33.0	25.0	50.50	....
29	29.80	45.0	29.78	48.0	29.74	47.0	58.0	34.0	24.0	46.00	....
30	29.76	58.0	29.68	53.0	29.62	49.0	62.0	43.0	19.0	52.50	....

Monthly range	49.5°
Monthly mean	45.97°
Monthly rainfall	2.13

Meteorological Record for May, 1891.

	8 A. M.		1 P. M.		6 P. M.		24 HOURS ENDING 8 A. M.				
Date.	Barometer.	Thermometer.	Barometer.	Thermometer.	Barometer.	Thermometer.	Maximum Thermometer.	Minimum Thermometer.	Daily Range.	Daily Mean.	Rainfall.
1	29.70	52.0°	29.73	48.0°	29.72	45.0°	61.0°	41 0°	20.0°	51.00°	....
2	29.93	61.0	29 94	63.0	29.93	55 0	65.0	44 5	20.5	54.75	....
3	29.94	50.0	29.86	53 0	29 82	46.0	57.0	35 0	22.0	46.00	0 02
4	29.99	55.0	29 87	60 0	29 80	57.0	62.5	32.5	30.0	47.50	0.04
5	29.87	46.5	29.85	50.0	29.85	42.0	51.0	29.0	22.0	40.00	....
6	29.85	50.0	29.85	50.0	29.83	45.0	54.0	36.0	18 0	45.00	0 01
7	30.01	50.0	30.06	52.5	30.06.	45.0	55.0	41.0	14 0	48 00	....
8	30 02	52 0	29.95	61.0	29.86	52 5	63.0	45 0	18.0	54.50	....
9	29.87	57.0	29 88	56.0	29.92	46.0	58.5	42 5	16.0	50.50	....
10	29.94	52.5	29.84	53.0	29.78	60.0	63.0	49 0	14.0	56.00	....
11	29 78	63.0	29.77	73.5	29.76	62 0	75.0	48 0	27.0	61 50	....
12	30.07	50.0	30.11	53 0	30.12	48.0	58.0	44.0	14.0	51 00	0.11
13	30.07	48.0	30.05	54 0	30 02	47.0	63.0	40.0	23 0	51.50	....
14	30.04	63 0	30.03	66.0	30.00	60.0	68 0	47.0	21.0	57.50	....
15	30.14	56 0	30.16	54.0	30.11	50.0	56.0	46.0	10.0	51.00	0.57
16	29 91	49.0	29.77	53.0	29 70	52.0	57.0	42 5	14 5	49.75	0.71
17	29 76	51.0	29.78	51.0	29.87	46.0	52.0	36 0	16.0	44 00	....
18	29.88	51.0	29.80	49.0	29.78	54.0	59 5	35.5	24.0	47.50	....
19	30.17	57.5	30.18	58.0	30.18	53.0	60.5	42 0	18 5	51.25	....
20	30.42	56.5	30.45	60 0	30.42	66.0	69.0	52 0	17.0	60.50	....
21	30.44	65.0	30 34	70.5	30.24	63.5	72.0	55.0	17 0	63.50	....
22	29.93	66.0	29 82	77.0	29.80	69.0	79.0	46 0	33.0	62.50	0.03
23	30.06	53.5	30 10	47.5	30.09	46.0	58.0	39 0	19.0	48 50	....
24	30.15	58.0	30.12	53 0	30 07	54.5	63.0	47 0	16 0	55.00	....
25	30.04	63.0	29.97	55.0	29.93	60.0	70 0	50 0	20.0	60.00	....
26	29.92	70.0	29.88	65 0	29 88	56 0	70 0	42 0	28.0	56.00	0 10
27	30 18	62.0	30 22	53 0	30.18	50 0	64 0	41.0	23.0	52 50	....
28	30 21	63.0	30.19	61.0	30.16	56.0	67.0	45 0	22.0	56 00	....
29	30 07	50 0	30.04	54.0	29.99	50 0	58.0	50.0	38 0	54 00	0.39
30	29 99	58.0	29 94	62 5	29.75	63.5	73 5	57 0	16.5	65.25	....
31	29 96	73.5	29.96	69.0	29.95	57.6	72.5	47.5	25 0	60.00	....

Monthly range . . . . 50.0°

Monthly mean . . . . 53.27°

Monthly rainfall 1.98

Meteorological Record for June, 1891.

	8 A. M.		1 P. M.		6 P. M.		24 HOURS ENDING 8 A. M.				
Date.	Barometer.	Thermometer.	Barometer.	Thermometer.	Barometer.	Thermometer.	Maximum Thermometer.	Minimum Thermometer.	Daily Range.	Daily Mean.	Rainfall.
1	29.93	53.0°	29.91	60.0°	29 84	57.0°	73.0°	53.0°	20.0°	63.00°	....
2	29.88	73.0	29.87	73.0	29 89	66.0	79.0	58.0	21.0	68.50	0.19
3	30 00	61.0	30.04	60.0	30 00	55.0	63.0	45.0	18.0	54.50	0.40
4	30.01	45.0	30.07	48 0	30.07	48.0	62.0	40.0	22.0	51.00	....
5	30.15	62.0	30.13	62.5	30.11	62.0	71.0	42.0	29 0	56.50	....
6	30 18	68.0	30.17	65.0	30.12	54 0	69.0	52.0	17.0	60.50	....
7	30.13	57 0	30.10	69 0	30.04	61.5	74.0	50 0	24.0	62.00	....
8	30.10	74.0	30.09	74.0	30 05	72.0	75.0	55.0	20.0	65 00	....
9	30.09	72.0	30.08	76.5	30 08	71.0	77.0	52 0	25.0	64.50	....
10	30.10	69.0	30.06	65.0	30.00	74.0	78 0	57.0	21.0	67.50	....
11	30 02	72 0	29.99	82.0	29.94	76.0	83.0	61.0	22.0	72.00	....
12	29.92	77 0	29 90	81.0	29.89	77.0	82 5	58.0	24.5	70.25	....
13	30 08	79.0	30.08	74.0	30.08	71.0	81 0	57.0	24.0	69.00	....
14	30.07	81.0	30 02	81.5	29.98	77.5	86.0	62.0	24.0	74.00	....
15	29.96	86.0	29.92	84 0	29.89	86.0	88.0	66.0	22.0	77.00	....
16	29.88	86.0	29.81	87.0	29.74	84.0	89.0	67.0	22 0	78.00	....
17	29.84	67.0	29 91	59.5	29.92	51.5	67.0	49.0	18 0	58.00	0.55
18	29.93	50.0	29 92	51.8	29.85	48.5	53.0	48.0	5.0	50.50	0.56
19	29 80	48.0	29.83	59 0	29 82	55 0	60.0	52.0	8 0	56.00	0.11
20	29.88	55.0	29 90	60.0	29.92	59 0	63.0	55.0	8.0	59.00	....
21	29.95	63.5	29.94	66 0	29 92	60 5	71 0	58.0	13.0	64.50	0.60
22	29.86	58.0	29 80	57.0	29 76	60.0	63.0	56.0	7.0	59.50	1.57
23	29.79	56.0	29.79	64 0	29.73	65 5	69.0	58.0	11 0	63.50	....
24	29.82	62.0	29.82	69.0	29.84	69 0	72.0	52.0	20 0	62 00	....
25	29.91	65.0	29.89	68 0	29.86	70.0	72.0	57.0	15.0	64.50	....
26	29.86	68.0	29.84	70.0	29.78	64.0	70 0	52.0	18.0	61.00	....
27	29 84	56.0	29 86	58.0	29.84	59.5	65 0	52.0	13.0	58.50	....
28	29.77	59.0	29.72	61.0	29 72	59 0	62.0	53.0	9 0	57.50	0 02
29	29.78	59.0	29.76	67.0	29 74	71.0	74.0	54.0	20.0	64.00	....
30	29.89	60.0	29.93	67.0	29.95	64.0	69.0	51.0	18.0	60.00	....

Monthly range	49.0°		
Monthly mean		63.04°	
Monthly rainfall			4.00

Meteorological Record for July, 1891.

	8 A. M.		1 P. M.		6 P. M.		24 HOURS ENDING 8 A. M.				
Date.	Barometer.	Thermometer.	Barometer.	Thermometer.	Barometer.	Thermometer.	Maximum Thermometer.	Minimum Thermometer.	Daily Range.	Daily Mean.	Rainfall.
1	30.05	64.0°	30.06	68.0°	30.06	68.0°	70.0°	54.0°	16.0°	62.00°	....
2	30.08	63.0	30.07	68.0	30.03	64.0	69.0	55.0	14.0	62.00	....
3	29.96	62.0	29.92	63.0	29.87	72.0	73.0	59.0	14.0	66.00	0.41
4	29.76	64.0	29.74	70.0	29.74	71.0	74.0	56.0	18.0	65.00	....
5	29.80	66.0	29.79	71.5	29.78	66.5	73.0	56.0	17.0	64.50	....
6	29.77	63.0	29.76	66.0	29.81	68.0	69.0	54.0	15.0	61.50	....
7	29.94	64.5	29.94	70.0	29.92	62.0	74.0	55.0	19.0	64.50	0.67
8	29.70	61.0	29.79	68.0	29.84	65.5	70.0	56.0	14.0	63.00	....
9	29.96	61.5	30.00	65.0	30.00	68.0	68.0	52.0	16.0	60.00	....
10	30.18	64.0	30.23	69.0	30.23	73.5	74.0	52.5	21.5	63.25	....
11	30.29	69.5	30.30	69.0	30.25	64.0	72.0	53.0	19.0	62.50	....
12	30.21	63.5	30.16	69.5	30.12	67.5	72.5	60.0	12.5	66.25	....
13	30.12	72.5	30.11	79.0	30.07	82.0	83.0	64.0	19.0	73.50	....
14	30.05	74.0	30.03	82.0	29.98	79.0	85.0	67.0	18.0	76.00	....
15	25.95	73.5	29.88	79.5	29.85	78.0	82.0	66.0	16.0	74.00	0.04
16	29.93	72.0	29.92	79.0	29.93	74.0	81.0	60.0	21.0	70.50	....
17	30.07	69.0	30.08	75.0	30.07	77.0	78.0	57.0	21.0	67.50	....
18	30.08	68.0	30.06	71.0	29.96	61.0	74.0	60.0	14.0	67.00	0.29
19	29.80	68.5	29.90	79.5	29.96	72.5	82.0	62.0	20.0	72.00	....
20	30.16	71.5	30.18	74.0	30.16	67.5	76.0	62.0	14.0	69.00	....
21	30.20	70.0	30.25	71.0	30.27	72.0	73.0	56.0	17.0	64.50	....
22	30.39	67.0	30.38	67.5	30.35	69.5	70.0	55.0	15.0	62.50	....
23	30.37	62.5	30.35	65.0	30.29	68.5	70.0	55.0	15.0	62.50	....
24	30.12	65.5	30.00	67.0	29.94	69.0	70.0	60.0	10.0	65.00	0.37
25	29.90	70.0	29.90	76.0	29.87	69.5	78.0	60.0	18.0	69.00	....
26	29.96	64.0	29.95	64.5	29.92	61.0	68.0	54.0	14.0	61.00	....
27	29.92	60.0	29.90	68.5	29.90	69.0	72.0	52.0	20.0	62.00	....
28	30.06	61.0	30.06	73.0	30.05	71.0	73.0	60.0	13.0	66.50	0.67
29	30.06	61.0	30.06	68.0	30.04	65.0	68.0	57.0	11.0	62.50	0.07
30	29.97	65.0	29.92	72.5	29.85	64.0	73.5	57.5	16.0	65.50	0.68
31	29.80	60.5	20.84	65.0	29.83	65.5	66.0	47.5	18.5	56.75	0.05

Monthly range . . . . 37.5°
Monthly mean . . . . 65.41°
Monthly rainfall 3.25

Meteorological Record for August, 1891.

	8 A. M.		1 P. M.		6 P. M.		24 HOURS ENDING 8 A. M.				
Date.	Barometer.	Thermometer.	Barometer.	Thermometer.	Barometer.	Thermometer.	Maximum Thermometer.	Minimum Thermometer.	Daily Range.	Daily Mean.	Rainfall.
1	29.86	61.0°	29.80	68.0°	29.74	67.0°	74.0°	60.0°	14.0°	67.00°	0.03
2	29.72	64.0	29.73	70.5	29.73	66.0	72.5	54.0	18.5	63.25	....
3	29.97	63.5	30.00	69.0	30.00	67.0	69.0	58.0	11.0	63.50	....
4	30.02	69.0	30.03	69.5	30.13	64.0	74.0	57.0	17.0	65.50	....
5	30.17	67.0	30.17	73.0	30.16	66.5	73.0	60 0	13.0	66.50	0.28
6	30.16	65.0	30.16	69.5	30.14	64.5	72.0	55.0	17.0	63.50	....
7	30.11	65.5	30.07	74 5	30.00	69.0	74.0	62.5	11.5	68.25	0.05
8	29.95	68.5	29.94	74.5	29.94	71.5	77.5	56.0	21.5	66.75	...
9	30 04	66.0	30.02	68.0	30.00	65.5	74 0	64.0	10.0	69.00	....
10	29 92	74.0	29 90	83 0	29.92	83.5	85 0	65.0	20.0	75.00	....
11	30.02	75.5	30.00	75.0	29.93	75.0	80.0	70.0	10.0	75 00	....
12	29.87	78.0	29.85	85 0	29.86	75.0	85.5	63.5	22.0	74.50	0.02
13	29.93	69 0	29.96	71.0	29.97	70.0	74.0	58.0	16.0	66 00	....
14	30.05	69.0	30 05	74.0	30.04	71.5	77 0	53.0	24 0	65.00	....
15	30.05	67.0	30 03	62 0	29.97	62.0	67.0	57.0	10.0	62.00	0 45
16	30.06	61.0	30.06	71.0	30.04	62.0	70.5	56.5	14.0	63.50	....
17	30.06	65.5	30 05	72.0	30.03	72.0	74.5	57.5	17.0	66.00	....
18	29.97	68 5	29.93	76.5	29.88	72.5	77.0	61.0	16.0	69.00	....
19	29.94	64.5	30.00	65.0	30.00	65.0	66.5	54.5	12.0	60.50	....
20	30.05	63.5	30 02	74.0	29.98	73.0	75.0	63.0	12.0	69.00	....
21	29.85	72.5	29.81	76.0	29.77	74.0	78.5	67.5	11.0	73.00	0.48
22	29.78	71.5	29.82	76 0	29.84	72.5	80.0	61.0	19.0	70.50	0.03
23	29.95	67.5	29.95	70.5	29 94	67.5	75.5	65.0	10.5	70.25	....
24	29.96	72.5	29.99	78 0	29.99	76.0	80.0	66 5	13.5	73.25	....
25	30 10	72.0	30.12	81.0	30.13	79.0	83.0	64.0	19.0	73.50	....
26	30.29	67.5	30.28	75.0	30.25	67 5	75.0	62.0	13.0	68.50	....
27	30.16	63.5	30.10	69.0	30.06	63.5	69 5	62 5	7.0	66.00	0.37
28	29 92	67.0	29.87	69.0	29.83	66.0	73.0	52.0	21.0	62.50	1.09
29	29.97	57.5	30 00	61.5	30.06	65.0	61.0	56.0	5.0	58.50	....
30	30.23	58.0	30.22	60.0	30.20	56.5	62.5	52.5	10 0	57.50	0.20
31	30.19	56.5	30.18	60.5	30.18	56.5	61.0	55.0	6.0	58.00	0.25

Monthly range	33.5°		
Monthly mean		66.78°	
Monthly rainfall			3.25

Meteorological Record for September, 1891.

	8 A. M.		1 P. M.		6 P. M.		24 HOURS ENDING 8 A. M.				
Date.	Barometer.	Thermometer.	Barometer.	Thermometer.	Barometer.	Thermometer.	Maximum Thermometer.	Minimum Thermometer.	Daily Range.	Daily Mean.	Rainfall.
1	30.20	58.0°	30.18	62.5°	30.15	58.0°	63.5°	51.5°	12.0°	57.50°	....
2	30.12	59.5	30.11	67.0	30.10	63 0	69 0	51.0	18.0	60.00	....
3	30.16	59.0	30 15	68.5	30.15	69.0	73.0	58 0	13.0	65.50	....
4	30.14	63.5	30.13	68.5	30.10	68.5	71.0	59.0	12.0	65.00	....
5	30.26	65.0	30.28	63 5	30.25	58.0	65.5	57.5	8.0	61.50	0.25
6	30.14	60.0	30.10	61.0	30.04	57.5	62 5	58.0	4.5	60.25	1.46
7	29.91	61.0	29.75	61.0	29.69	60.5	63.0	50.0	13.0	56.50	0.57
8	29.98	58.0	30.00	67.0	30.02	61.5	68 0	43 0	25.0	55.50	....
9	30 17	52.0	31 16	61.0	30.15	60.0	63.5	48.0	15.5	55.75	...
10	30.32	58.0	30.33	68 0	30.31	60.0	69.0	50.0	19.0	59.50	....
11	30.35	60.0	30 33	68 5	30.29	65.0	70.0	53.0	17.0	61.50	....
12	30.28	60.0	30.25	68.5	30.20	62.5	70.0	57.0	13.0	63.50	....
13	30.06	61.5	29.97	71.5	29 89	65.0	73.5	60 5	13.0	67.00	0.28
14	29.80	64.0	29.78	69 0	29.78	62.5	69.0	47.0	22.0	58.00	....
15	29.97	51.5	29.97	59.0	29 94	58.0	63.0	52.0	11.0	57.50	....
16	30.07	58.0	30.13	62.0	30.14	58.5	64 0	50.0	14 0	57.00	....
17	30 32	59 0	29.32	64.0	30.26	61.5	66 0	58.0	8.0	62.00	0.07
18	30.13	66.0	30.03	79.0	29 92	75.0	80.0	62.0	18.0	71.00	....
19	30.06	67.0	30.10	63.0	30.14	57.0	66.5	49.5	17.0	58.00	....
20	30.23	57.0	30 21	64.5	30.14	61.0	65.0	52.0	13.0	58.50	....
21	30.10	60.0	30 09	68.5	30.07	63.5	69.0	58.0	11.0	63.50	....
22	30.17	60.5	30.16	64.0	30.13	60 0	65.0	59.0	6.0	62 00	....
23	30.05	64.0	30.05	69 0	30 08	63.5	69.5	58.5	11.0	64.00	....
24	30.25	64 0	30.23	68.0	30.19	64.0	69.0	60.0	9.0	64.50	....
25	30.15	66.0	30 07	75 0	30 03	71.5	77.0	64.0	13.0	70.50	....
26	30.08	71.0	30.13	69.0	30.18	61.0	73.0	54.0	19.0	63.50	....
27	30.32	62.0	30 31	64.0	30.28	61 0	65.0	60.0	5.0	62.50	....
28	30.30	65.0	30.27	73 0	30.24	68.0	73.0	60.0	13.0	66.50	....
29	30.19	65.5	30.08	72.0	30.04	68.0	72.0	50 0	22.0	61.00	0.14
30	30.25	52.5	30.37	57.5	30.32	52.0	58.0	43.0	15.0	50.50	....

Monthly range . . . . 37.0°
Monthly mean . . . . 61.38°
Monthly rainfall 2.77

Meteorological Record for October, 1891.

	8 A. M.		I P. M.		6 P. M.		24 HOURS ENDING 8 A. M.				
Date.	Barometer.	Thermometer.	Barometer.	Thermometer.	Barometer.	Thermometer.	Maximum Thermometer.	Minimum Thermometer.	Daily Range.	Daily Mean.	Rainfall.
1	30.51	49.0°	30 53	55.0°	30.48	51.0°	56 0°	41.0°	15.0°	48.50°	....
2	30.39	50.5	30.32	60.5	30.27	56.5	63.0	48.0	15.0	55.50	....
3	30.16	56 5	30.07	64.0	30.09	63.0	66.5	55.0	11.5	60.75	....
4	29.92	63.0	29.85	68.0	29.75	59.0	68.0	55.0	13.0	61.50	0.07
5	29.66	56 0	29.63	61.0	29.63	59.0	61.0	45.0	16.0	53.00	0 06
6	30.00	48.5	30.05	55.0	30.10	52.0	57.0	47.0	10.0	52.00	....
7	30 23	51.0	30.20	56.0	30.15	52.0	56.0	48.0	8.0	52.00	1.75
8	29.61	50.0	29.72	53.0	29.76	53.5	57.0	40.0	17.0	48.50	....
9	29 96	46.0	29.99	53.0	30 03	46.0	53.0	38.0	15.0	45.50	....
10	30.08	45.5	30.07	55.0	30.04	49.5	56.0	43.0	13.0	49.50	0.07
11	30.07	48.0	30.14	54 0	30 35	41.0	56.0	35 0	21 0	45.50	0.07
12	30.59	39 0	30.60	45 0	30.58	40 0	46.0	39 0	7.0	42.50	....
13	30.43	46.0	30.33	47 0	30.23	44.0	47.0	39.0	8 0	43.00	1 83
14	29.81	42.5	29.88	55.5	29 92	55.0	56.0	44.0	12.0	50 00	....
15	29 94	50 5	29.90	53.5	29.85	49.0	58 0	38.0	20.0	48 00	....
16	29.96	44.0	29.99	53.5	30.03	46.5	54.0	38.0	16.0	46.00	....
17	30.28	43.5	30.33	49.0	30.34	43.5	49.5	37.0	12.5	43.25	....
18	30.36	42.0	30.34	54.0	30.30	46.0	55.0	43.0	12.0	49.00	....
19	30.11	46.5	30.05	51.5	30.02	49.5	52.5	46.5	6.0	49.50	....
20	29 98	48.5	29 86	48.5	29.74	47.5	51.5	40.5	11 0	46 00	0.66
21	29.69	43.5	29.70	51.0	29.79	45.5	52.0	35.0	17 0	43.50	....
22	29.88	43.5	29.86	49.5	29.85	45.5	49.5	31.5	18.0	40.50	0.33
23	29.63	31.5	29.57	39 0	29.58	34.0	39.0	31.0	8.0	35.00	0.15
24	29 62	36.0	29.63	40.5	29.68	35.0	40.5	28.0	12.5	34.25	....
25	29.85	30.0	29.89	44.0	29.93	37.0	47.0	29.0	18.0	38.00	....
26	29.87	43.5	29.72	49 5	29 66	47.0	53.0	43.5	9.5	48.25	0.12
27	29.61	44.0	29.65	41.0	29.74	39.0	44.0	34.0	10.0	39 00	0.09
28	30.06	35.0	30.10	39.5	30.14	32.0	41.0	22.0	19.0	31.50	....
29	30.38	28.0	30.43	36 5	30.40	35.0	38.0	28.0	10 0	33.00	....
30	30 31	36.0	30.20	52.0	30.14	48.5	53 0	37.0	16.0	45.00	....
31	30 08	48.5	29.98	60.0	29.94	52.0	59.0	44.0	15.0	51.50	....

Monthly range . . . . 44.0°
Monthly mean . . . . 46.09°
Monthly rainfall 5.13

Meteorological Record for November, 1891.

	8 A. M.		1 P. M.		6 P. M.		24 HOURS ENDING 8 A. M.				
Date.	Barometer.	Thermometer.	Barometer.	Thermometer.	Barometer.	Thermometer.	Maximum Thermometer.	Minimum Thermometer.	Daily Range.	Daily Mean.	Rainfall.
1	29.80	45.0°	29.80	50.5°	29.86	42.0°	50.5°	27.0°	23.5°	38.75°	....
2	30.14	29.5	30.05	36.5	30.15	32.0	37.0	23.0	14.0	30.00	....
3	30.28	27.0	30.29	33.5	30.26	29.0	35.0	20.0	15.0	27.50	....
4	30.26	26.0	30.26	37.5	30.23	31.0	37.5	26.0	11.5	31.75	....
5	30.15	32.0	30.11	40.5	30.08	35.5	40.0	32.0	8.0	36.00	0.01
6	30.09	33.5	30.11	40.5	30.11	35.5	41.0	29.0	12.0	35.00	....
7	30.07	34.5	30.03	42.0	30.03	40.5	43.0	35.0	8.0	39.00	....
8	30.05	38.0	30.06	41.0	30.08	36.5	41.0	29.0	12.0	35.00	....
9	30.20	32.0	30.22	42.5	30.22	40.5	44.0	34.0	10.0	39.00	...
10	30.27	41.5	30.26	45.5	30.25	45.5	49.0	42.0	7.0	45.50	....
11	30.04	49.5	29.93	55.0	29.87	54.0	56.0	37.0	19.0	46.40	0.26
12	29.97	42.0	29.95	49.5	29.93	45.0	50.0	33.0	17.0	41.50	....
13	30.13	36.5	30.17	45.0	30.20	40.0	46.0	29.0	17.0	37.50	....
14	30.35	32.0	30.36	45.0	30.36	40.5	45.0	25.0	20.0	35.00	....
15	30.56	27.0	30.62	34.0	30.62	31.0	38.5	26.5	12.0	32.50	....
16	30.57	38.5	30.45	48.0	30.35	46.0	53.5	38.5	15.0	46.00	0.28
17	29.98	54.0	29.74	59.0	29.58	55.5	59.0	27.0	32.0	43.00	0.28
18	30.04	28.5	30.17	32.0	30.33	25.5	32.0	17.0	15.0	24.50	....
19	30.72	22.5	30.75	31.0	30.73	28.5	32.0	23.0	9.0	27.50	....
20	30.66	32.5	30.61	40.5	30.58	35.5	41.0	27.0	14.0	34.00	....
21	30.57	32.5	30.55	43.5	30.51	41.5	44.0	33.0	11.0	38.50	....
22	30.40	39.0	30.32	49.0	50.27	44.0	49.0	40.0	9.0	44.50	....
23	29.96	45.0	29.76	47.0	29.62	46.5	50.0	39.0	11.0	44.50	0.21
24	29.49	40.0	29.53	46.5	29.60	38.0	47.0	29.0	18.0	38.00	....
25	29.91	32.0	29.92	39.0	29.90	34.0	41.0	25.0	16.0	33.00	....
26	30.09	28.5	30.06	36.0	29.98	34.5	38.0	29.0	9.0	33.50	1.17
27	29.54	35.0	29.61	42.0	29.74	34.0	43.0	32.0	11.0	37.50	0.01
28	29.71	43.5	29.68	50.0	29.74	36.0	50.0	13.0	37.0	31.50	....
29	30.18	15.0	30.20	18.5	30.21	18.0	20.0	5.0	15.0	12.50	....
30	30.21	8.0	30.22	18.0	30.20	18.0	22.0	8.0	14.0	15.00	....

Monthly range	54.0°		
Monthly mean		35.13°	
Monthly rainfall			2.22

Meteorological Record for December, 1891.

	8 A. M.		1 P. M.		6 P. M.		24 HOURS ENDING 8 A. M.				
Date.	Barometer.	Thermometer.	Barometer.	Thermometer.	Barometer.	Thermometer.	Maximum Thermometer.	Minimum Thermometer.	Daily Range.	Daily Mean.	Rainfall.
1	30.23	22.0°	30.24	33.0°	30.22	30.0°	36.0°	22.0°	14.0°	29.00°	....
2	30.14	31.5	30.08	44.0	30.04	38.0	44.0	31.0	13.0	37.50	....
3	30.19	34.0	30.24	50.0	30.26	38.0	50.0	33.0	17.0	41.50	....
4	30.28	40.0	30.14	45.0	29.95	43.0	45.0	34.0	11.0	39.50	0.25
5	29.95	36.0	29.98	44.5	29.98	39.0	44.5	36.0	8.5	40.25	....
6	29.96	37.0	29.96	48.0	29.97	43.0	48.0	37.0	11.0	42.50	0.15
7	29.65	48.0	29.55	50.0	29.60	41.5	50.0	25.0	25.0	37.50	0.18
8	30.12	26.5	30.23	34.0	30.24	29.5	35.0	26.5	8.5	30.75	....
9	30.14	35.0	30.11	43.0	30.11	40.0	44.0	34.0	10.0	39.00	....
10	30.12	34.5	30.07	48.0	30.05	41.0	51.0	35.0	16.0	43.00	....
11	30.12	36.0	30.12	44.0	30.14	40.0	44.0	26.0	18.0	35.00	....
12	30.28	27.5	30.22	37.0	30.17	36.0	39.0	28.0	11.0	33.50	....
13	30.06	33.0	29.93	46.5	29.94	43.0	48.0	33.0	15.0	40.50	....
14	29.99	37.0	29.98	44.0	30.05	42.0	46.0	28.0	18.0	37.00	....
15	30.29	29.5	30.20	30.5	30.01	34.0	37.0	30.0	7.0	33.50	0.60
16	29.34	32.5	29.37	38.5	29.48	30.5	38.5	12.0	26.5	25.25	....
17	29.76	13.0	29.86	18.0	30.04	10.0	18.0	7.0	11.0	12.50	....
18	30.40	12.5	30.47	29.0	30.44	29.0	30.0	12.5	17.5	21.25	....
19	30.37	27.0	30.36	37.0	30.37	31.0	38.5	25.5	13.0	32.00	....
20	30.42	28.5	30.42	40.0	30.42	36.0	45.0	29.0	16.0	37.00	....
21	30.41	36.0	30.41	45.0	30.42	40.0	46.0	35.0	11.0	40.50	....
22	30.37	36.0	30.32	46.0	30.26	45.0	54.0	36.0	18.0	45.00	0.10
23	30.16	52.0	30.05	56.0	29.94	53.0	58.0	45.0	13.0	51.50	0.19
24	30.11	45.0	30.15	46.0	30.13	43.0	47.5	39.0	8.5	43.25	0.45
25	30.08	40.0	30.13	41.5	30.15	40.0	42.5	39.5	3.0	41.00	0.02
26	30.00	42.0	29.80	46.0	29.64	50.0	54.0	31.5	22.5	42.75	0.23
27	29.80	33.0	29.85	36.0	29.91	32.0	38.0	26.0	12.0	32.00	....
28	30.17	27.0	30.26	34.0	30.32	30.0	36.0	23.0	13.0	29.50	....
29	30.36	35.0	30.26	41.0	30.11	42.5	50.0	35.0	15.0	42.50	1.20
30	29.52	46.0	29.60	39.0	29.78	35.0	46.0	16.0	30.0	31.00	0.02
31	30.30	17.5	30.40	27.0	30.43	25.0	29.0	12.0	27.0	20.50	....

Monthly range	51.0°
Monthly mean	35.73°
Monthly rainfall	3.39

SUMMARY OF STATISTICS.

Report of 1891.

LYNN WATER WORKS, LYNN, MASS.

Population by census of 1890, 55,727

Date of construction, 1870 to 1872.

Owned by City of Lynn.

Source of supply, **Four artificial storage basins, formed by constructing dams across the valleys of four brooks, and the water of one other brook in North Saugus taken direct.**

Mode of supply, **By gravitation to the pump well, and pumped thence to a distributing reservoir at an elevation of 177 feet above mean high tide by one Leavitt engine, built by J. P. Morris & Co., of Philadelphia, of 5,000,000 daily capacity, and one Loretz engine of 10,000,000 daily capacity.**

1. Kind of coal used, **George's Creek Cumberland.**
2. Cost of coal, **$4.75 and $4.50 per net ton (2,000 lbs.) delivered.**

	Leavitt.	Loretz.
3. Coal consumed for the year, in pounds,	399,150	1,240,600

	Leavitt.	Loretz.
4. Total pumpage for the year, in gallons,	298,507,982	844,784,152
5. Average dynamic head against which pump works,	164.92	157.03
6. *a*. Number of gallons pumped per pound of coal,	680.95	747.86
b. Number of gallons raised 100 feet per pound of coal,	1,067.80	1,237.63
7. Duty, in foot pounds per 100 pounds of coal, no deductions, $\text{Duty}=\frac{\text{gallons pumped(4)}\times 8.34\times 100\times\text{dynamic head(5)}}{\text{total coal consumed}}$	102,863,001	89,179,013

COST OF PUMPING, FIGURED ON PUMPING STATION EXPENSES, VIZ., $9,718.42.

8. Per million gallons raised against average dynamic head (5) into reservoir,	$8.50
9. Per million gallons raised one foot high (dynamic),	5.41 cents

COST OF PUMPING, FIGURED ON TOTAL MAINTENANCE, VIZ., $113,420.30.

10. Per million gallons raised against dynamic head (5) into reservoir,	$99.22
11. Per million gallons raised one foot high,	63.18 cents

FINANCIAL.

MAINTENANCE.

RECEIPTS.		EXPENDITURES.	
From consumers:			
A. Water rates, domestic,	$116,159 75	AA. Management and repairs,	$30,872 86
B. Water rates, manufacturing,	29,855 44	BB. Interest on bonds,	82,547 44
C. Net receipts for water,	$146,015 19	CC. Total maintenance,	$113,420 30
D. Repairs and sundries,	1,793 02	DD. Balance carried to sinking fund,	54,387 91
E. Total from ordinary consumers,	$147,808 21		
F. From public funds, general appropriation,	20,000 00		
G. Gross receipts from all sources,	$167,808 21	EE. Total,	$167,808 21

CONSTRUCTION.

RECEIPTS.		EXPENDITURES.	
F. From balance of 1890,	$16,499 92	FF. Extension of main lines,	$53,803 61
G. Appropriations bonded,	75,000 00	GG. Extension of service pipes,	12,498 28
H. Pipes, meters and labor,	11,445 28	HH. Meters,	2,726 59
		II. Account Loretz engine,	12,237 92
		JJ. Account ponds,	8,675 68
		KK. Account Moore boiler,	4,674 61
		LL. Total construction for year,	$94,616 69
		MM. Balance,	8,328 51
I. Total,	$102,945 20	NN. Total,	$102,945 20

J. Net cost of works to date . .	$1,916,518 97
K. Bonded debt, Dec. 31, 1891 . .	1,584.500 00
L. Value of sinking fund . . .	171,565 56
M. Rate of interest . . .	3½, 3¾, 4, 4½, 5, 6

CONSUMPTION.

Estimated population to date (Lynn and Saugus),	62,500
Estimated population supplied,	59,400
Total number of gallons consumed for the year,	1,142,943,580
Number of gallons metered,	149,275,000
Average daily consumption in gallons,	3,131,352
Gallons per day to each consumer,	52.71

DISTRIBUTION.

Kind of pipe used,	Wrought iron cement-lined and cast iron
Size,	From 2 to 16 inches in diameter
Extended,	6 miles, 3,874 feet
Total now in use,	98 miles, 3,653 feet
Number of leaks for the year,	136
Hydrants added,	47
Hydrants now in use,	705
Gates added,	53
Gates now in use,	854
Range of pressure of city for day and night,	50 to 65 pounds

SERVICES.

Kind of pipe used,	iron, cement-lined adamanta and galvanized iron
Size of pipe used,	¾ to 10 inches in diameter
Extended,	28,924 feet
Discontinued,	4,275 feet
Number of services added,	597
Number of services discontinued,	97
Number of services now in use,	9,678
Total length of services,	76 miles, 4,003 feet
Number of services added in Saugus,	56
Number of services now in use in Saugus,	348
Length of services added in 1891,	2,944 feet
Total length of services in Saugus,	3 miles, 2,525 feet
Meters added,	73
Meters now in use,	413

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ASTOR LENOX AND
TILDEN FOUNDATIONS.

ANNUAL REPORT

OF THE

PUBLIC WATER BOARD

OF THE

CITY OF LYNN

For the Year Ending December 31, 1892.

LYNN, MASS.:
Whitten & Cass, Printers,
1893.

ANNUAL REPORT

OF THE

PUBLIC WATER BOARD

OF THE

CITY OF LYNN

FOR THE YEAR ENDING DECEMBER 31, 1892.

LYNN, MASS.:
WHITTEN & CASS, PRINTERS,
1893.

R. L. M.

OFFICERS FOR 1892.

E. B. Billings,
For one year.

Quincy A. Towns,
For two years.

W. B. Littlefield, *Pres.*,
For three years.

David Knox,
For four years.

D. A. Sutherland,
For five years.

Superintendent and Clerk, John C. Haskell.
Water Registrar, Wallace O. Mudge.
Pumping Engineer, C. A. Cowles.
Assistant Engineer, G. S. Sanborn.
Foreman of Mains, Edwin Maxwell.
Foreman of Services, Henry Wheelock,
Foreman of Meters and Repairs, W. H. McClain.
Inspectors. Winslow J. Rowell, W. B. Moulton, J. Frank Pool.

PUBLIC WATER BOARD FOR 1893.

Quincy A. Towns, for one year.
W. B. Littlefield, *Pres.*, for two years.
David Knox, for three years.
D. A. Sutherland, for four years.
John Macnair, for five years.

ANNUAL REPORT.

Office of the Public Water Board,
January 1, 1893.

To the Honorable Mayor and City Council of the City of Lynn:

The Public Water Board hereby presents to the City Council its twenty-first annual report, together with the reports of the Superintendent and Registrar.

WATER SUPPLY.

The water supply of the City of Lynn consists of Breeds, Birch, Walden, and Glen Lewis Ponds, and Hawkes Brook. The water from Breed's pond flows through an 18″ pipe direct to the pumping station. From Birch, direct through a 22″ pipe to the pumping station. From Glen Lewis into Walden, over a spillway or through a 36″ pipe, passing under the dam at the gatehouse. From Walden pond through a canal, and tunnel to the upper end of Birch Pond; then by a 30″ pipe under the pond, connecting with the 22″ pipe leading from Birch Pond to the pumping station.

The water from the canal can run into Birch Pond by gravity until it reaches a depth of 9 feet. At the lower end of the canal, a pumping station is located, containing an Ide engine and Webber centrifugal pump of 10,000,000 gallons daily capacity to lift the water from the canal into Birch Pond. The water from Hawkes Brook flows through a canal into Walden Pond canal.

Water can be taken from each of these sources separately, or conjointly by the following combinations:

First. Breed's and Walden Ponds and Hawkes Brook.
Second. Breed's and Walden Ponds.
Third. Breed's and Birch Ponds.
Fourth. Breed's Pond and Hawkes Brook.
Fifth. Hawkes Brook and Walden Pond.

The possible benefit to be gained by handling the different sources separately is that during the year there are periods when the water in one pond is better than in any of the others, thus allowing its use without contamination from poorer water.

The advantage derived by drawing from two sources conjointly is in enabling us to take the entire flow of water from Hawkes Brook at all times, utilizing the waters of the brook when the flow is not sufficient for the full daily supply, by supplementing it from the pond in which the water is the best.

In addition to this supply, we have a right to take the waters of Saugus River, at any time when there is more than 12,000,000 gallons of water per day running at Pranker's mill. A canal is constructed from Saugus River at Howlett's mill to the Hawkes Brook canal for this purpose, but, up to the present time, we have not been obliged to draw from this source.

The past summer is the third since Walden and Glen Lewis Ponds have been used as Reservoirs. The first appearance of algae was noticed in June, 1890; since then the water has not been entirely free from its presence.

For the past year we cannot see any perceptible improvement in either pond over previous years.

We found it necessary to discontinue the use of water from these ponds very early in the summer on account of the large growth of algae, which caused the water to taste exceedingly disagreeable.

The growth of algae is caused by the presence of organic matter in the bottom of the ponds. It is doubtful if the water can be used in the summer months for many years. The quality of the water would be improved by removing the organic matter, but from the deep deposits existing, would necessarily be a very expensive undertaking.

The water from these ponds has been used through the winter season, allowing Breed's and Birch Ponds to fill for use during the summer months.

The trouble we have experienced the past year has convinced us that we should take measures to ascertain the nature of the various organisms which are to be found in the water.

The Superintendent can, by microscopical examination, detect the noxious organisms upon their first appearance, and stop its use before the water becomes unpleasant.

In the report of Mr. Kirkwood on the water supply for the City of Lynn, adopted by the City Council March 7th, 1876, a pond was advised in the basin of Hawkes Brook, 20 feet in depth, containing 70 acres water surface, and with 170,000,000 gallons storage capacity.

During the last summer Mr. Isaac K. Harris, C. E., has made a survey of the basin to ascertain the practicability of securing a greater depth, and it has been found possible to increase the depth to 25 feet, with an area of 78 acres water surface, and storage capacity of 287,000,000 gallons. While this reservoir will be needed to form a portion of the water supply of Lynn, its construction can be deferred for a season, although our experience in Walden Pond shows the importance of constructing the basin in advance of our actual needs, to give time for the purification of its water by natural causes.

To estimate the probable increase in consumption for the next ten years, we will figure on the basis furnished by the last ten.

In 1882, the consumption was 551,428,907 gallons; in 1892, 1,299,041,098 gallons, showing an increase of 13.5 per cent. per year. Taking the last five years, in 1887 the consumption was 868,346,338 gallons, making the increase from 1887 to 1892 ten per cent. per year; this smaller increase was probably on account of the fire of Nov. 26th, 1889. Taking the last two years, in 1890 the consumption was 969,692,037 gallons, an increase of 17 per cent. per year. This rapid rate was partly caused by the increased use of hose rendered necessary by the light rainfall, together with the more general connection of dwellings with the sewers, and a rapid growth in population. From these figures it would seem probable that the increase for the next ten years would not be less than 13 per cent. per year on the present consumption, which would make the consumption for 1902 2,987,794,525 gallons, or more than double our present supply.

On November 9th, 1891, there were stored in Breed's and Birch Ponds, 83,606,566 gallons of water, equal to twenty-seven days' consumption ; in Walden and Glen Lewis Ponds 307,770,640 gallons, equal to ninety-eight days' consumption, making a total of 125 days' supply. From this time no available water has been wasted, and the entire yield of our drainage basin has been stored or used. On November 9th, 1892, there were stored in Breed's and Birch Ponds, 34,196,665 gallons, equal to ten days' supply, in Walden and Glen Lewis Ponds, 367,783,639 gallons, equal to 103 days' supply, making a total storage on hand of 113 days. During this twelve months the total available yield of our entire water-shed was 1,285,493,656 gallons, a deficiency of twelve days' supply. Had the rainfall for this period been, as in 1883, 29.14 inches instead of 40.67 inches, it is evident that without any allowance for increased consumption due to the extreme dry weather, or the fact that with a small rainfall a less proportion of that rainfall can be gathered, we should have received a total yield of 921,054,466 gallons to meet a consumption of 1,274,890,558 gallons, leaving a deficiency of 353,836,092 gallons, equal to ninety-nine days' supply. As on Nov. 9th, 1892, we had 113 days' supply in the ponds, it is evident that we would have been obliged to use Walden Pond water during the summer of 1892, for eighty-nine days.

The experience of the last year shows that with the present consumption we now have sufficient storage capacity for all the water that the water-shed can furnish, and that nothing will be gained by the addition of Hawkes Brook pond until we can add to the water supply, except furnishing a basin containing less organic matter than Walden Pond, and which will furnish good water through the summer months at an earlier date. In view of the probable increased consumption as estimated, our present supply, together with the addition of all water that could be secured when more than 12,000,000 gallons of water were running in Saugus River at Pranker's mill, will be inadequate within five years, and the Board recommends that the City Council petition the Legislature for the right to take the waters of Saugus River and its tributaries above Howlett's mill for an additional water supply.

HIGHLAND SERVICE.

The problem of supplying better pressure to the high service has received especial attention. Examinations made for that purpose by A. J. L. Loretz of Brooklyn, N. Y., and George H. Bishop of Middletown, Conn., resulted in reports on three distinct systems, the first of which consists in locating an entire pumping plant near the present distributing reservoir, and pumping the water from this reservoir into another reservoir to be located upon the adjacent hill, with a maximum head of forty-six feet above the present reservoir. The estimated first cost is $51,600.00, with a yearly cost for maintenance of $3,100.00

System two consists of a hydraulic engine, taking the water from the force main between the pumping station and the reservoir, and pumping into a stand pipe on the hill above the present reservoir. First cost $36,500.00, yearly expense for maintenance $850.00.

Third system requires a reservoir, as in the first system, and consists of two pumps attached to the double Loretz engine, and pumping the water from the pump well into the high service reservoir, the power to be supplied from surplus steam in the Loretz engine. First cost $40,500.00, no expense for maintenance.

Mr. J. O. Heinze has another solution of the problem under consideration, and will submit his report, and a proposition to construct the work to the Board.

Still another system, to pump the water by a hydraulic engine from the distributing main into a stand pipe to be located on the hill, is being investigated.

When all proposed systems have been examined, the Board will submit a report on the various propositions to the City Council.

STREET MAINS.

Persuant to an order passed by the City Council, a 20-inch main was laid from the pumping station on Walnut street, passing through Walnut, Winter, Cedar, Mall, and North Common streets, City Hall square and Central avenue, connecting with the 16-inch main at Andrew street, also through Liberty to Willow street. By the addition of this main, we now have an ample supply of water sufficient to meet all demands of a greater conflagration than the fire of Nov. 26th, 1889.

The cement lined pipes, formerly supplying the residents on the streets through which the 20″ pipe is laid, have been abandoned, and the services connected with the large main. The cement lined pipes in State, Suffolk, and a portion of Pleasant street and Harrison court have been taken out and replaced with cast-iron mains.

Numerous bursts occurred in the cement lined pipes; nearly all came in the night, at the time when the pressure is the greatest; by prompt repairs no business interest suffered from being deprived of water. It is the intention of the Board to replace a portion of the cement lined pipes each year, with cast-iron, taking all residential streets where the expense of maintenance approaches the interest on the cost of replacing with cast-iron pipe, and all business streets where mains are in poor condition, and wherever it is the intention of the City Council to pave a street.

The rapid increase of new streets called for a large amount of new work. Mains were laid in all streets petitioned for where the abutters were willing to pay five per cent. on the cost of laying the pipe, until the water rates on the street equal the five per cent. per year.

By an order passed in the City Council June 9, 1892, authority was given the Public Water Board to purchase land on the water shed of Walden and Glen Lewis Ponds.

The following pieces of property have been purchased under the act:

H. A. Newhall and Jackson heirs, 3 acres, 70 rods	$206 25
Caleb Johnson, 6 acres	120 00
F. L. Johnson, 3 acres	60 00
J. B. & H. C. Newhall, 11 acres	220 00
P. A. Chase, 5 acres	100 00
P. A. Chase	860 88
O. B. Mudge, 1⅞ acres	114 50
Also a piece of land on the borders of Breed's Pond from E. Breed el al., containing 4¾ acres for .	1,187 50

WATER DEBT STATEMENT FOR THE YEAR ENDING DEC. 20, 1892.

RECEIPTS AND EXPENDITURES.

Water debt December 20, 1891 . . .	$1,584,500 00	
Amount borrowed during year ending December 20, 1892	75,000 00	$1,659,500 00
Amount of debt paid during year ending December 20, 1892		33,000 00
Amount of debt outstanding		$1,626,500 00
Receipts from water rates during the year .	$168,093 70	
Appropriated to water sinking funds by City Council in 1892	20,000 00	
Receipts from premiums, and accrued interest on loans	7,194 73	$195,288 43
Expenditures charged to water maintenance .		98,845 47
Net receipts carried to sinking funds . . .		$96,442 96

CONDITION OF SINKING FUNDS.

Amount of sinking funds Dec. 20, 1891, as per report of commissioners		$171,565 56
Amount paid to commissioners by city treasurer during year 1892	$56,806 05	
Income from investments reported by commissioners	6,930 81	63,736 86
Total amount sinking funds		$235,302 42
Deduct amount paid on account of matured bonds		33,000 00
Amount in hands of commissioners December 20, 1892		$202,302 42
Add net receipts from water maintenance not yet paid to commissioners		76,442 96
Total amount in hands of commissioners and in city treasury, of sinking funds, December 20, 1892		$278,745 38

Respectfully submitted,

W. B. LITTLEFIELD,

President.

Report of the Water Registrar.

OFFICE OF THE WATER REGISTRAR,
LYNN, January 2, 1893.

To W. B. Littlefield, Esq., President Public Water Board:

SIR,—I herewith present the financial condition of the Department for the year ending December 31, 1892.

RECEIPTS.

Fixture rates		$123,436 78
Meter rates		39,040 31
Additional rates		3,868 60
Miscellaneous rates		1,872 71
Fines		130 40
Total revenue		$168,348 80
Extra pipe and labor	$7,427 27	
Sale of wood	220 25	
		7,647 52
Total receipts as per cash book		$175,996 32

COMPARATIVE STATEMENT OF REVENUE.

Revenue collected during the year		$168,348 80
City appropriation		20,000 00
Amount outstanding fixture rates	$3,363 89	
Amount outstanding meter rates	739 53	
Amount outstanding meter rates, not due	9,832 01	
		13,935 43
		$202,284 23
Deduct amount due January 1, 1892		13,304 35
Revenue for year 1892		$188,979 88
Revenue for year 1891		171,744 85
Increase		$17,235 03

STATEMENT OF NET EARNINGS FOR 1892.

Revenue		$188,979 88

EXPENSES.

Interest	$69,893 77	
Maintenance	28,126 14	
		98,019 91
Net earnings		$90,959 97

EXPENDITURES.

MAINTENANCE.

Pumping expenses	$9,957 00	
Salaries and office expenses	6,057 62	
Repairs on mains	3,560 27	
Repairs on services	3,034 13	
Stable and workshop	1,568 17	
New supply	1,016 45	
Engines and boilers	675 19	
Meters	583 83	
Walden Pond	809 12	
Birch Pond	315 85	
Breed's Pond	115 43	
Reservoir	132 09	
Damages	138 51	
Engine house	162 48	
		$28,126 14

CONSTRUCTION EXPENSES.

Mains, hydrants and gates	$55,135 61	
Services and courts	12,810 08	
Meters	2,554 56	
Hawkes Pond	2,306 52	
Walden Pond	1,681 63	
Breed's Pond	1,187 50	
Loretz engine	645 65	
Engine house shed	226 00	
Yard shed	99 85	
Highland service	80 50	
		$76,727 90
Amount received for pipe, etc.	$7,427 27	
Amount received for wood	220 25	
		7,647 52
Net		$69,080 38

STATEMENT.

SHOWING COST OF WORKS TO JANUARY 1, 1893.

Mains, hydrants and gates		$791,584 17
Services and courts		249,083 04
New supply and land		236,336 58
New basin and land		179,440 50
Engines and boilers		140,327 29
Reservoir and land		131,581 49
Birch Pond and land		93,471 84
Engine house and land		57,562 39
Breed's Pond and land		56,435 28
Pipe conduit and land		45,293 98
Force mains and land		41,546 13
Meters		30,330 86
Highland service		12,431 17
Tubular wells		9,374 02
Engineering		8,564 99
Hawkes' Pond		2,306 52
Work shop and stable		2,056 97
Total cost		$2,087,727 22
Less amount received for pipe	$95,975 94	
Less amount received for wood	4,151 93	
Less amount received for Deane pump	2,000 00	
		102,127 87
Total net cost		$1,985.599 35

Following will be found the usual tables, exhibiting the number of buildings, families, stores, factories, etc., supplied with water, the class of premises to which meters are attached, the number and kinds of fixtures, the yearly revenues of the department, etc.

Respectfully submitted,

WALLACE O. MUDGE,

Water Registrar.

SERVICES.

Whole number of services		10,588
Put in during the year	742	
Discontinued	175	
Not in use	82	
Turned on (new services)	600	
Turned on (re-occupied)	128	
Turned on (change of ownership)	24	
Turned on (rates and fines paid)	3	
Shut off (for vacancy)	162	
Shut off (for non-payment)	5	
Services put in at Saugus, 1892	93	
Whole number at Saugus	440	

The ratio of yearly increase in the number of services from 1876 is as follows:

1876	6.54 per cent.	1885	6.36 per cent.
1877	7.60 " "	1886	6.58 " "
1878	6.14 " "	1887	5.84 " "
1879	6.04 " "	1888	6.67 " "
1880	8.75 " "	1889	6.67 " "
1881	10.25 " "	1890	7.40 " "
1882	9.92 " "	1891	6.90 " "
1883	10.80 " "	1892	6.00 " "
1884	8.62 " "		

STATEMENT

SHOWING THE NUMBER OF BUILDINGS TO WHICH WATER IS SUPPLIED, ALSO THE NUMBER OF FAMILIES, VARIOUS FIXTURES, ETC., CONTAINED IN THE SAME, TOGETHER WITH THE NUMBER OF FIRE HYDRANTS, DEC. 31, 1892.

	LYNN.	SAUGUS.	TOTAL.
Dwellings	9,320	394	9,714
Stores and shops	965	20	985
Factories	213		213
Offices	471	10	481
Restaurants and saloons	104		104
School-houses	42		42
Churches	27	2	29
Bakeries	32		32
Laundries	16		16
Engine-houses	8	3	11
Families	14,089	466	14,555
Boarding-houses	262		262
Faucets	23,998	753	24,751
Water-closets	9,144	140	9,284
Bath tubs	3,252	109	3,361
Hand hose	2,923	142	3,065
Urinals	248	2	250
Heaters	545	16	561
Stationary engines	166	2	168
Motors	25		25
Greenhouses	26	4	30
Drinking fountains	24		24
Standpipes, fire	15	1	16
Standpipes for water carts	36		36
Sewer connections	16		16
Automatic sprinklers	62		62
Hydrants	747	120	867

STATEMENT

SHOWING THE YEARLY REVENUE OF THE DEPARTMENT SINCE THE FIRST INTRODUCTION OF WATER INTO THE CITY IN 1871.

From October 1, 1871, to January 1, 1872	$8,989	00
From January 1, 1872, to January 1, 1873	27,568	16
From January 1, 1873, to January 1, 1874	47,992	61
From January 1, 1874, to January 1, 1875	53,545	61
From January 1, 1875, to January 1, 1876	52,553	26
From January 1, 1876, to January 1, 1877	60,867	12
From January 1, 1877, to January 1, 1878	64,002	50
From January 1, 1878, to January 1, 1879	67,570	14
From January 1, 1879, to January 1, 1880	73,949	80
From January 1, 1880, to January 1, 1881	79,635	12
From January 1, 1881, to January 1, 1882	80,967	76
From January 1, 1882, to January 1, 1883	94,419	52
From January 1, 1883, to January 1, 1884	98,893	54
From January 1, 1884, to January 1, 1885	114,903	86
From January 1, 1885, to January 1, 1886	110,089	11
From January 1, 1886, to January 1, 1887	116,375	70
From January 1, 1887, to January 1, 1888	123,507	73
From January 1, 1888, to January 1, 1889	134,480	27
From January 1, 1889, to January 1, 1890	141,865	53
From January 1, 1890, to January 1, 1891	154,788	27
From January 1, 1891, to January 1, 1892	171,744	85
From January 1, 1892, to January 1, 1893	188,979	88
	$2,067,689	34

FUNDED WATER LOAN.

When Payable.	Rate Per. Cent.	Amount.
Feb. 1, 1893	4	$13,400 00
Feb. 1, 1893	3¾	25,800 00
May 1, 1893	3¾	2,000 00
May 1, 1894	3¾	10,000 00
July 1, 1894	6	100,000 00
Jan. 1, 1896	6	50,000 00
Jan. 1, 1899	5	50,000 00
Jan. 1, 1900	5	50,000 00
Apr. 1, 1900	4	10,000 00
Jan. 1, 1901	5	50,000 00
Mar. 1, 1903	4	8,000 00
May 1, 1904	3¾	7,300 00
Jan. 1, 1905	5	200,000 00
Apr. 1, 1905	4	150,000 00
May 1, 1905	3½	71,500 00
Dec. 1, 1905	3½	5,000 00
Nov. 1, 1913	4	20,000 00
Nov. 1, 1913	3¾	31,000 00
Mar. 15, 1914	4	50,000 00
Dec. 1, 1914	4	20,000 00
Dec. 1, 1915	3½	6,000 00
Apr. 1, 1916	3½	2,000 00
May. 1, 1916	3½	24,500 00
Sep. 1, 1916	4	10,000 00
Oct. 1, 1916	4	9,000 00
Feb. 1, 1917	3½	6,500 00
June 1, 1917	3½	3,500 00
July 1, 1917	4	7,500 00
Aug. 1, 1917	4	5,000 00
Oct. 1, 1917	4	2,000 00
Nov. 1, 1917	4	6,500 00
Apr. 1, 1918	4	15,000 00
June 1, 1918	4	10,000 00
July 1, 1918	4	50,000 00
Apr. 1, 1919	4	100,000 00
July 1, 1919	4	110,000 00
Jan. 1, 1920	4	35,000 00
Apr. 1, 1920	4	150,000 00
Apr. 1, 1921	4	50,000 00
Oct. 1, 1921	4	25,000 00
Jan. 1, 1922	4	50,000 00
July 1, 1922	4	25,000 00
		$1,626,500 00

Report of the Superintendent.

To William B. Littlefield, Esq., Pres't Public Water Board:

Sir:—In compliance with the city ordinance, I respectfully herewith present the annual report of the Superintendent for the year ending Dec 31, 1892.

WATER SUPPLY.

On the first of January, 1892, the depth of water in Breed's pond was 13′ 4″, equal to 79,810,136 gallons; Birch pond was 10′ 6″, equal to 84,918,462 gallons; Walden pond was 8′ 3″, equal to 98,396,330 gallons; Glen Lewis pond was 17′ 2″, 122,946,810 gallons, making a total of 386,071,738 gallons, equal to 123 days' supply, figured on the average consumption per day for 1891.

All of the available rainfall on our watershed during the year, was collected, enabling us to show the capability of our water supply for 1892, which gave a yield of 1,329,202,559 gallons.

On January first, 1893, the depth of water in Breed's pond was 11′ 5″, equal to 49,172,745 gallons; Birch pond was 7′ 2″, equal to 19,490,226 gallons; Walden pond was 14′ 10″, equal to 313,943,830 gallons; Glen Lewis pond was 8′ 11″, equal to 33,626,398 gallons, making a total of 416,233,199 gallons, equal to 117 days' supply, figured on the average consumption per day for 1892, leaving a deficiency for the year of six days' supply.

As the storage capacity of the ponds is 1,167,265,193 gallons, we have an opportunity to collect 751,031,994 gallons before any need run to waste.

In 1892 the supply was in excess of the consumption until June 4th.

The amount required for consumption from Jan. 1st, 1893 to June 4th, 1893, figured on the daily average for 1892, will be 551,647,635 gallons, making the yield necessary to fill the ponds by June 4th, 1893, 1,302,679,629 gallons, an amount but 16,522,930 gallons less than the total yield of our water supply for 1892. From these figures there seems to be no possibility that our ponds can fill without an additional supply is furnished.

As in previous years the water in Walden and Glen Lewis ponds became unfit for use early in the summer. No water was taken from this source from July 7th, until Nov. 14th, since which time our supply has been taken from Hawke's brook and Walden pond.

During the year 289,320,938 gallons were taken from Breed's pond, 313,399,048 gallons from Birch pond, and 696,321,112 gallons from Walden pond and Hawke's brook through the canal, making a total of 1,299,041,098 gallons pumped, being 155,748,964 gallons in excess of the amount pumped in 1891.

The amount of water taken from each source monthly can be seen in Table III.

An examination of the analysis of the water made by the State Board of Health will show the quality of water used.

CANAL.

Three of the bridges across the canal have been rebuilt and one repaired, 80 feet of one bank of the canal was spiled to stop leaks caused by the action of the frost in the earth, and the stone masonry at the overflows has been repointed. The sides of the canal are in good condition.

PUMPING STATION.

The buildings are in good condition.

A new door has been built for the coal shed and the windows thoroughly puttied up to replace the old putty where it had been broken off. No repairs have been needed on the Leavitt engine. The valve seat was examined in October and found to be in about the same condition as when last reported.

The check valve in the 20″ delivery pipe from the Leavitt pump should be replaced with a new one, the old one being so badly worn as to make it necessary to close the 20″ gate whenever the engine is stopped.

The boiler feed pumps attached to the Loretz engine have had new plungers inserted, changing them from bucket to plunger pumps, thereby reducing the noise and adding to their efficiency. The pump barrels have been cut and connected with flanges, making it much more convenient to pack the plungers, the ball check valves used as suction and delivery valves for the feed pumps have been removed and replaced with larger ones with a flat seat and Jenkins' valve which made less noise and will wear much longer than the old ones. Floor gratings have been set around the Loretz engine and guard gates at the cross heads, making less danger in operating the pumps. The expansion joint on the engine and the steam pipe connected with it have been taken down and new joints made, also a number of leaks stopped in the exhaust pipes. The steam pipes leading from the Moore boiler have been taken down and new joints made throughout. The necessary repairs have been made to the furnaces. The setting of the old boiler should be repaired as soon as possible. The grate surface of the Moore boiler has been reduced one foot in depth and a heater set in the flue in addition to the one set with the boiler, a damper has been placed in the connecting flue and attached to the damper regulator. All of the feed pipes to the boiler have been covered with asbestos.

WATER MAIN FOR FIRE SUPPLY.

In accordance with an order passed in the Board of Aldermen, June 30th, 1891, a 20″ main was laid from the pumping station through Walnut, Winter, Cedar, Mall and No. Common streets, City Hall square, Central avenue to Andrew street and through Liberty street from Central avenue to Willow street. By the addition of this main we now can supply over one million gallons of water per hour in the business portion of the city.

STREET MAINS.

During the year the cement lined pipes in State, Suffolk, Centre, and Harrison court, Western avenue from Federal street to Centre street, Pleasant street from Summer to Sea street were taken out and replaced with cast-iron mains. The cement lined pipes in the streets through which the 20″ main was laid were discontinued.

Thirty-five thousand four hundred and thirty-six feet of cast-iron pipe from 4″ to 20″ in diameter has been laid in 66 streets, of this amount 12,849 feet replaced cement pipe previously laid; 1,357 feet of smaller size has been laid in courts as mains; 257 services were changed from the old pipe to the new; 44 gates have been set in connection with the new mains; 648 services have been put in, aggregating 27,639 feet in length; 34 services have been extended of a total length of 1,544 feet; 175 services have been discontinued.

In trenching for mains 1,850 feet of ledge has been excavated; 2 old hydrants replaced with new ones; 28 leaky hydrants repaired; 2 gates taken out and replaced; 6 new gate boxes set to replace old ones; 580 corporations have been dug up and drilled out; 225 new iron stop boxes to replace wooden ones; 78 stop boxes and 30 gate boxes were changed where the grade of streets was changed; 83 new meters were set; 9 meters taken out; 72 meters changed and repaired; 8 outside meter boxes put in; 39 stop and wastes put in to replace old ones; 139 leaks in service pipes were repaired..

The following tables show the work performed by the department during the year.

Respectfully submitted,

JOHN C. HASKELL,

Superintendent.

ANALYSIS OF WATER IN BREED'S POND BY STATE BOARD OF HEALTH.

PARTS IN 100,000.

DATE OF		APPEARANCE.			ODOR.		RESIDUE ON EVAPORATION.			AMMONIA.					NITROGEN.		
							Filtered.				Albuminoid.						
Collection.	Examination.	Turpidity.	Sediment.	Color.	Cold.	Hot.	Total.	Loss on ignition.	Fixed.	Free.	Total.	In Solution.	In Suspernsion.	Chilorine.	As Nitrates.	As Nitrites.	Hardness.
Jan. 7	Jan. 8	Distinct.	Considerable.	0.60	Vegetable frequently, also unpleasant or disagreeable.	Generally somewhat stronger.	3.80	1.50	2.30	.0006	.0242	.0184	.0058	.45	.0090	.0000	0.6
Feb. 8	Feb. 9	Slight.	Slight.	0.50			4.10	1.35	2.75	.0004	.0210	.0168	.0042	.54	.0100	.0003	0.9
March 8	March 9	"	"	0.70			4.10	1.60	2.50	.0016	.0242	.0210	.0032	.59	.0070	.0000	0.6
April 12	April 13	Very slight.	"	0.30			3.70	1.30	2.40	.0000	.0156	.0138	.0018	.48	.0050	.0000	0.6
May 9	May 10	" "	"	0.28			3.50	1.60	1.90	.0000	.0182	.0168	.0014	.50	.0030	.0000	0.8
June 6	June 7	Distinct.	Cons. white.	0.40			3.65	1.40	2.25	.0000	.0186	.0134	.0052	.52	.0000	.0000	0.5
July 11	July 12	Slight.	Slight.	0.30			3.45	1.30	2.15	.0002	.0264	.0180	.0084	.52	.0030	.0000	0.8
Aug. 8	Aug. 9	"	"	0.25			3.10	1.15	1.95	.0000	.0200	.0164	.0036	.54	.0030	.0001	1.1
Sept. 12	Sept. 13	"	"	0.30			3.45	1.45	2.00	.0000	.0214	.0190	.0024	.44	.0090	.0000	1.6
Oct. 10	Oct. 12	"	"	0.30			3.40	0.50	2.90	.0000	.0280	.0238	.0042	.48	.0050	.0000	1.1
Nov. 9	Nov. 10	"	"	0.50			3.90	1.90	2.00	.0024	.0236	.0168	.0068	.47	.0000	.0001	1.6
Dec. 7	Dec. 9	"	Cons. brown.	0.70			3.70	1.50	2.20	.0000	.0228	.0178	.0050	.41	.0120	.0000	1.7

ANALYSIS OF WATER IN BIRCH POND BY STATE BOARD OF HEALTH.

PARTS IN 100,000.

DATE OF		APPEARANCE.			ODOR.		RESIDUE ON EVAPORATION.			AMMONIA.					NITROGEN.		
							Filtered.				Albuminoid.						
Collection.	Examination.	Turpidity.	Sediment.	Color.	Cold.	Hot.	Total.	Loss on ignition.	Fixed.	Free.	Total.	In Solution.	In Suspernsion.	Chilorine.	As Nitrates.	As Nitrites.	Hardness.
Jan. 7	Jan. 8	Slight.	Slight.	0.60	Generally vegetable and unpleasant or disagreeable.	Vegetable and grassy or sweetish.	4.40	2.00	2.40	.0000	.0436	.0336	.0100	.44	.0050	.0000	0.8
Feb. 8	Feb. 9	Distinct.	"	0.55			4.45	1.80	2.65	.0000	.0318	.0242	.0076	.53	.0250	.0003	0.9
March 8	March 9	Slight.	"	0.15			3.70	1.50	2.20	.0042	.0210	.0158	.0052	.69	.0070	.0001	0.6
April 12	April 13	"	"	0.15			3.80	1.40	2.40	.0012	.0274	.0208	.0066	.44	.0050	.0001	0.8
May 9	May 10	"	"	0.15			3.05	1.35	1.70	.0000	.0214	.0160	.0054	.46	.0030	.0000	1.1
June 6	June 7	Distinct.	Cons. white.	0.25			3.50	1.15	2.35	.0030	.0258	.0150	.0108	.48	.0000	.0000	0.8
July 11	July 12	Slight.	Slight.	0.23			3.10	1.60	1.50	.0014	.0320	.0230	.0090	.44	.0050	.0001	0.9
Aug. 8	Aug. 9	"	Slight green.	0.50			3.40	1.45	1.95	.0000	.0236	.0216	.0020	.47	.0030	.0001	1.3
Sept. 12	Sept. 13	Distinct.	Cons. rusty.	0.60			3.55	1.65	1.90	.0000	.0282	.0214	.0068	.45	.0070	.0002	0.8
Oct. 10	Oct. 12	"	Cons. brown.	0.80			3.45	1.45	2.00	.0056	.0334	.0252	.0082	.45	.0100	.0001	1.0
Nov. 9	Nov. 10	"	Cons. green.	1.10			3.90	1.75	2.15	.0030	.0334	.0278	.0056	.44	.0180	.0001	1.3
Dec. 7	Dec. 9	Distinct green.	" "	0.70			4.50	1.65	2.85	.0008	.0368	.0278	.0090	.41	.0220	.0001	2.1

ANALYSIS OF WATER IN GLEN LEWIS POND BY STATE BOARD OF HEALTH.

PARTS IN 100,000.

DATE OF		APPEARANCE.			ODOR.		RESIDUE ON EVAPO'TION.			AMMONIA.					NITROGEN.		
							Filtered.				Albuminoid.						
Collection.	Examination.	Turpidity.	Sediment.	Color.	Cold.	Hot.	Total.	Loss on Ignition.	Fixed.	Free.	Total.	In Solution.	In Suspension.	Chlorine.	As Nitrates.	As Nitrites.	Hardness.
Jan. 7	Jan. 8	Slight.	Cons. green.	0.80	Vegetable.	Often disagreeable.	4.15	2.00	2.15	.0102	.0546	.0372	.0174	.37	.0600	.0001	0.3
Feb. 8	Feb. 9	"	Slight.	0.55			3.35	1.75	1.60	.0014	.0932	.0448	.0484	.43	.0350	.0005	0.5
March 8	March 9	Very slight.	"	0.40			3.60	1.70	1.90	.0274	.0302	.0228	.0074	.44	.0300	.0001	0.2
Apr. 12	Apr. 13	Slight.	Con. green and earthy.	0.50			3.80	1.85	1.95	.0006	.0484	.0302	.0182	.40	.0020	.0001	0.5
May 9	May 10	Distinct.	Considerable.	0.50			3.50	1.85	1.65	.0058	.0310	.0252	.0058	.38	.0120	.0000	0.9
June 6	June 7	"	Slight.	0.50			3.85	1.60	2.25	.0064	.0342	.0262	.0080	.41	.0120	.0002	0.2
July 11	July 12	Slight,	Considerable.	0.70			3.95	1.60	2.35	.0026	.0510	.0350	.0160	.46	.0050	.0000	0.5
Aug. 8	Aug. 9	"	Slight rusty.	0.50			4.05	2.00	2.05	.0040	.0328	.0300	.0028	.38	.0050	.0003	1.1
Sept. 12	Sept. 13	Distinct green.	Cons. rusty.	0.80			4.35	2.35	2.00	.0236	.0552	.0400	.0152	.36	.0120	.0003	1.6
Oct. 10	Oct. 12	Slight.	Slight.	0.95			4.90	2.80	2.10	.0448	.0446	.0404	.0042	.37	.0200	.0007	0.6

ANALYSIS OF WATER IN WALDEN POND BY STATE BOARD OF HEALTH.

PARTS IN 100,000.

DATE OF		APPEARANCE.			ODOR.		RESIDUE ON EVAPO'TION.			AMMONIA.					NITROGEN.		
							Filtered.				Albuminoid.						
Collection.	Examination.	Turpidity.	Sediment.	Color.	Cold.	Hot.	Total.	Loss on Ignition.	Fixed.	Free.	Total.	In Solution.	In Suspension.	Chlorine.	As Nitrates.	As Nitrites.	Hardness.
Jan. 7	Jan. 8	Dec'd slight scum	Considerable.	0.80	Generally decidedly vegetable and unpleasant or disagreeable.	Somewhat stronger.	5.25	2.75	2.50	.0000	.0644	.0422	.0222	.41	.0250	.0001	0.6
Feb. 8	Feb. 9	Slight.	Slight.	0.80			4.15	2.30	1.85	.0012	.0450	.0342	.0108	.41	.0250	.0005	0.6
March 8	March 9	"	Cons. green.	1.20			4.00	2.00	2.00	.0032	.0282	.0162	.0120	.41	.0170	.0000	0.3
Apr. 12	Apr. 13	Distinct.	Considerable.	0.55			3.85	1.35	2.50	.0012	.0442	.0280	.0162	.41	.0020	.0000	0.5
May 9	May 10	Decided.	Heavy green.	0.60			3.50	1.80	1.70	.0000	.0570	.0288	.0282	.39	.0050	.0000	0.6
June 6	June 7	Distinct.	Cons. white.	0.90			4.30	1.90	2.40	.0496	.0420	.0330	.0090	.38	.0050	.0002	0.2
July 11	July 12	Decided green.	Cons. green, layer on top.	1.00			4.70	2.30	2.40	.0028	.1356	.0468	.0888	.38	.0050	.0000	0.6
Aug. 8	Aug. 9	" "	Heavy rusty.	1.00			5.55	3.10	2.45	.0004	.0946	.0476	.0470	.48	.0050	.0001	0.8
Sept. 12	Sept. 13	Distinct green.	Con. green and rusty.	0.90			6.30	3.80	2.50	.0008	.0736	.0488	.0248	.36	.0120	.0003	0.5
Oct. 10	Oct. 12	Decided.	Cons. light green.	0.90			5.60	3.00	2.60	.0000	.0632	.0456	.0176	.44	.0030	.0000	0.8
Nov. 9	Nov. 10	Slight.	Considerable.	0.90			5.35	3.10	2.25	.0382	.0512	.0424	.0088	.40	.0150	.0001	0.6
Dec. 7	Dec. 9	"	"	1.20			5.15	2.85	2.30	.0152	.0524	.0456	.0068	.40	.0300	.0001	1.3

TABLE I.

SHOWING THE CONSUMPTION OF WATER FOR THE YEAR ENDING DECEMBER 31, 1892.

MONTH.	Monthly Consumption.	Average Consumption per day.	Average daily increase.	Average daily decrease.	Average to each consumer.	Average to each inhabitant.
	Gallons.	Gallons.	Gallons.	Gallons.	Galls.	Galls.
January	107,754,273	3,475,944	438,199	. . . . .	53.72	51.87
February	99,181,402	3,420,048	. . . . .	55,896	52.86	51.04
March	104,721,381	3,378,109	. . . . .	41,939	52.21	50.41
April	100,607,702	3,353,590	. . . . .	24,519	51.83	50.05
May	99,627,144	3,213,779	. . . . .	139,811	49.67	47.96
June	111,147,615	3,704,921	491,142	. . . . .	57.26	55.29
July	121,903,916	3,932,384	227,463	. . . . .	60.77	58.69
August	118,393,767	3,819,154	. . . . .	113,230	59.02	57.
September	110,414,700	3,680,490	. . . . .	138,664	56.88	54.93
October	112,903,872	3,642,060	. . . . .	38,430	56.29	54.35
November	102,486,248	3,416,208	. . . . .	225,852	52.80	50.98
December	109,899,078	3,545,132	128,924	. . . . .	54.79	52.91
Totals and Averages.	1,299,041,098	3,549,293	. . . . .	. . . . .	54.85	52.99

TABLE II.

AMOUNT OF WATER DRAWN FROM EACH SOURCE DURING THE YEAR 1892.

MONTH.	BREED'S.	BIRCH.	CANAL.	Total.
	Gallons.	Gallons.	Gallons.	Gallons.
January	7,312,086	....	97,112,511	104,424,597
February	687,531	....	99,800,975	100,488,506
March	....	....	105,791,438	105,791,438
April	8,501,648	....	93,507,854	102,009,502
May	30,392,515	....	67,388,322	97,780,837
June	32,479,799	....	80,965,318	113,445,117
July	52,747,013	55,321,402	9,728,583	117,796,998
August	21,046.935	100,235,765	....	121,282,700
September	38,135,011	72,279,689	....	110,414,700
October	41,892,656	68,743,154	....	110,635,810
November	39,527,457	16,819,038	47,645,803	103,992,298
December	16.598,287	....	94,380,308	110,978,595
Total	289,320,938	313,399,048	696,321,112	1,299,041,098

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TABLE III.

SHOWING THE RAINFALL AT THE PUMPING STATION FOR 1892.

Day of Month.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1	...	...	0.59	...	0.05	...	0.14	0.80	...	...	0.11	0.03
2	0.85	0.62	0.27	...	0.18	0.03	0.01	0.37	...	...	0.07	...
3	...	0.21	0.29	0.03	0.56	0.20	0.68	...	...	0.06	0.41	...
4	...	...	...	...	...	...	...	...	...	0.94	0.04	...
5	...	...	...	...	...	...	...	1.51	0.04	0 69	0.13	...
6	1.30	...	...	...	...	...	...	...	0.03	...	...	0.12
7	...	0.26	...	...	...	...	...	...	...	...	0.04	...
8	...	0.01	0.22	0.01	...	0.13	...	...	...	0.05	...	0.78
9	0.05	0.01	...	...	...	0.09	0.26	...	...	0.03	1.07	...
10	0.02	0.08	0.32	...	...	...	...	...	...	...	0.69	0.02
11	0.10	1.08	...	...	0.51	...	...	...	...	...	...	...
12	0.80	...	...	...	0.02	...	...	...	...	...	...	...
13	0.40	...	...	...	...	...	...	...	0.01	...	...	0.16
14	0.15	0.09	0.01	...	0.40	0.16	0.22	...	1.14	...	...	0.18
15	0.15	...	...	...	1.03	...	0.23	...	...	0.05	1.16	...
16	...	...	...	...	...	...	...	...	...	0.42	0.37	...
17	...	...	0.30	...	...	1.50	...	...	...	...	...	...
18	0.67	...	0.73	...	...	...	...	...	...	...	0.30	...
19	0.30	...	...	...	0.42	...	...	...	0.03	...	...	0.01
20	...	...	...	...	0.31	...	...	...	...	...	...	0.01
21	...	...	...	0.35	1.28	...	...	...	...	...	...	...
22	...	...	...	0.15	0.34	...	...	...	...	...	...	...
23	...	0.03	0.05	...	...	0.04	...	...	...	...	...	...
24	0.02	0.02	0.61	...	..	0.60	...	...	...	...	...	...
25	...	0.01	...	...	0.22	0.28	...	...	0.05	0.09	...	...
26	0.01	...	...	...	...	0.25	...	0.89	0.35	0.08	...	...
27	...	0.01	...	...	0.19	0.28	...	0.98	...	...	...	...
28	...	...	...	...	...	...	...	0.08	...	...	0.13	...
29	0.01	...	...	0.02	...	...	0.08	...	...	0.11	0.56	...
30	0.03	...	...	0.09	0 01	...	...	...	...	...	0.18	...
31	...	...	...	...	...	...	...	0.59	...	...	...	...
	4.86	2.43	3.33	0.65	5.53	3.56	1.62	6.95	1.65	2.52	5.26	1.31

Rainfall for the year, 39.67.

TABLE IV.

SHOWING THE DEPTH OF WATER IN THE PONDS FOR EACH WEEK DURING 1892.

Date.	Breed's Pond.		Birch Pond.		Walden Pond.		Glen Lewis Pond.		Date.	Breed's Pond.		Birch Pond.		Walden Pond.		Glen Lewis Pond.		Date.	Breed's Pond.		Birch Pond.		Walden Pond.		Glen Lewis Pond.	
	Ft.	In.	Ft.	In.	Ft.	In.	Ft.	In.		Ft.	In.	Ft.	In.	Ft.	In.	Ft.	In.		Ft.	In.	Ft.	In.	Ft.	In.	Ft.	In.
Jan. 1	13	4	10	6	8	3	17	2	May 1	20	. . .	16	8	13	8	17	2½	Sept 6	15	5½	11	7	13	7	17	. . .
" 7	13	10	11	. . .	9	3	17	4	" 7	20	2½	16	8½	13	6	17	3	" 12	15	1	10	8	13	5½	17	. . .
" 14	14	2	11	9	10		17	4	" 14	20	5	16	11½	13	7	17	3½	" 19	14	9½	10	½	13	6	17	1½
" 21	15	10	12	8	11	8	17	4	" 21	20	10	17	½	13	9½	17	3½	" 26	14	3½	9	3	13	5½	17	½
Feb. 1	16	4	13	3½	11	10	17	3½	" 28	21	. . .	15	7	15	1¼	17	4	Oct. 1	13	7	8	5½	13	5	17	. . .
" 8	16	6½	13	7	11	9½	17	3	June 4	20	8½	18	11	15	3½	17	4	" 8	13	2	7	11	13	3	17	½
" 15	16	11	13	10½	11	8	17	3	" 11	20	5	18	10	15	1½	17	3	" 15	12	9	7	1½	13	3	17	½
" 22	17	1½	13	11½	11	3½	17	3	" 18	20	1½	18	10	14	9	17	4	" 22	12	1	6	1½	15	4	9	4½
" 29	17	6	14	2	11	4	17	3	" 25	19	9	18	9	14	4½	17	3½	" 29	11	7	5	2	15	3	9	3½
Mar. 7	18	. . .	14	5	11	3½	17	3	July 2	19	5½	18	8½	14	3	17	3½	Nov. 5	10	10½	4	5	15	3	9	3½
" 14	18	11	14	11	12	5	17	3	" 9	18	6	18	6¾	14	2	17	1¾	" 12	10	7	4	6	15	6	9	6½
" 21	19	6	15	2	12	10	17	3	" 16	17	4½	18	5½	14	½	17	1	" 19	11	2	5	4	15	8	9	8½
" 28	19	10½	15	9	13	3½	17	3	" 23	16	10	17	5	13	10	17	. . .	" 26	11	5	5	8½	15	5	9	5½
Apr. 2	20	3½	16	1	13	9½	17	3	Aug 1	16	9½	16	. . .	13	9½	17	½	Dec. 3	11	9	6	½	15	7	9	7½
" 9	20	5	16	4½	14	2	17	3	" 8	16	8½	15	2½	13	8½	17	1	" 10	10	10	6	6	15	7	9	7½
" 16	20	5	16	6	14	2	17	3	" 15	16	6	14	4	13	8½	17	2	" 17	11	2	7	. . .	15	7½	9	8
" 23	20	3½	16	6½	13	6½	17	3	" 22	16	1½	13	5	13	7	17	½	" 24	11	5	7	1	15	5	9	5½
									" 31	15	9	12	2	13	7½	17	½	" 31	11	5	7	2	14	10	8	10½

TABLE V.

SHOWING THE LOCATION OF GATES SET IN 1892.

STREET.	LOCATION.
Adams court . .	On line S. side Adams street, 13 ft. W. of E. side of Adams court.
Amory	On line W. side Grove street, 17 ft. S. of N. side of Amory street.
Boston	On line W. side Cedar street, 14 ft. S. of N. side of Boston street.
Camden	On line E. side Cooper street, 17 ft. S. of N. side of Camden street.
Camden	On line E. side Cooper street, 17 ft. S. of N. side of River street.
Cooper	On line N. side Western avenue, 17 ft. W. of E. side of Cooper street.
Cedar	On line N. side Winter street, 17 ft. E. of W. side of Cedar street.
Cowdrey avenue .	On line W. side Lynnfield street, 17 ft. S. of N. side of Cowdrey avenue.
Dearborn's court.	On line N. side River street, 8 ft. E. of W. side of Dearborn's court.
Dell's court . .	On line N. side Oakland avenue, 7 ft. W. of E. side of Dell's court.
Elizabeth avenue .	On line W. side Cedar Hill avenue, 17 ft. S. of N. side of Elizabeth avenue.
Elmwood avenue .	On line S. side Neptune street, 17 ft. W. of E. side of Elmwood avenue.
Erie	On line W. side Eastern avenue, 17 ft. S. of N. side of Erie street.
Fairchild . . .	On line S. side Western avenue, 17 ft. W. of E. side of Fairchild street.
Franklin . . .	On line N. side North Common street, 17 ft. E. of W. side of Franklin street.
Garfield avenue .	On line S. side Washington avenue, 17 ft. W. of E. side of Garfield avenue.
Hathaway . . .	On line W. side Light street, 17 ft. S. of N. side of Hathaway street.
Hathaway . . .	On line E. side Minot street, 17 ft. S. of N. side of Hathaway street.
Hutchinson court	On line E. side J. W. Hutchinson's land, 11 ft. N. of S. side of Hutchinson's court.
Ida	On line N. side Camden street, 12 ft. W. of E. side of Ida street.
King's Beach Ter.	On line S. side Ocean street, 13 ft. W. of E. side of King's Beach Terrace.

TABLE V.—CONTINUED.

STREET.	LOCATION.
Lakewood avenue	On line W. side Euclid avenue, 17 ft. S. of N. side of Lakewood avenue.
Liberty	On line W. side Central avenue, 17 ft. N. of S. side of Liberty street.
Liberty	On line E. side Stewart street, 15 ft. S. of N. side of Liberty street.
Mall	On line W. side North Common street, 19 ft. S. of N. side of Mall street.
Newcomb avenue	On line S. side Holyoke street, 18 ft. W. of E. side of Newcomb avenue.
North Common .	Opposite centre pond in Common, 17 ft. S. of N. side of North Common street.
Oakville	On line S. side Neptune street, 17 ft. W. of E. side of Oakville street.
Orchard	On line S. side Neptune street, 17 ft. W. of E. side of Orchard street.
Pike's court . .	On line S. side Western avenue, 8 ft. W. of E. side of Pike's court.
Pitkin	On line S. side Neptune street, 17 ft. W. of E. side of Pitkin street.
Ray	On line W. side Light street, 21 ft. S. of N. side of Ray street.
Rhodes avenue .	On line N. side Boston street, 12 ft. W. of E. side of Rhodes avenue.
Safford	On line S. side Boston street, 10 ft. E. of W. side of Safford street.
Safford	On line E. side Summer street, 10 ft. S. of N. side of Safford street.
Sylvia	On line W. side Euclid avenue, 17 ft. S. of N. side of Sylvia street.
Sterling	On line W. side Walnut street, 17 ft. S. of N. side of Sterling street.
Western avenue .	On line W. side Mall street, 49 ft. S. of N. side of Western avenue.
Western avenue .	On line E. side Mall street, 50 ft. S. of N. side of Western avenue.
Washington . .	On line N. side Liberty street. 17 ft. N. of S. side of Washington street.
Winnepurkit ave.	On line N. side Holyoke street, 17 ft. W. of E. side of Winnepurkit avenue.
Western avenue .	On line W. side Centre street, 22 ft. S. of N. side of Western avenue.
Woodland avenue	On line E. side Eastern avenue, 17 ft. S. of N. side of Woodland avenue.
Verona	On line W. side Euclid avenue, 17 ft. S. of N. side of Verona street.
Verona	On line E. side Euclid avenue, 17 ft. S. of N. side of Verona street.

TABLE VI.

SHOWING THE LOCATION OF HYDRANTS SET IN 1892.

STREET.	LOCATION.
Allen avenue . .	247 feet from Morrill court.
Archer	783 feet from Eastern avenue.
Central avenue .	Corner Andrew street.
Cooper	Corner Western avenue.
Cowdrey . . .	289 feet from Lynnfield street.
Elmwood avenue .	348 feet from Neptune street.
Erie	246 feet from Eastern avenue.
Fairchild . . .	431 feet from Western avenue.
Fairchild . . .	862 feet from Western avenue.
Fairchild . . .	1312 feet from Western avenue.
Garfield avenue .	270 feet from Washington avenue.
Garfield avenue .	297 feet from Washington avenue.
Glenwood . . .	213 feet from Eastern avenue.
Grant	37 feet from corner Carlton street.
Hathaway . . .	239 feet from Light street.
King's Beach Ter.	557 feet from Ocean street.
Lake View avenue	384 feet from Euclid avenue.
Linwood . . .	850 feet from Quebec street.
Miller's court . .	312 feet from Broadway.
Mall	375 feet from Western avenue.

TABLE VI.—Continued.

STREET.	LOCATION.
North Common .	175 feet from Franklin street.
Marshall court .	308 feet from Broad street.
Orchard	300 feet from Neptune street.
Orchard	693 feet from Neptune street.
Oakville avenue .	344 feet from Neptune street.
Oakville avenue .	644 feet from Neptune street.
Pitkin	531 feet from Norton street.
Pleasant	55 feet from R. R.
Safford	365 feet from Boston street.
Suffolk	162 feet from Washington street.
Sterling	302 feet from Walnut street.
Sterling	657 feet from Walnut street.
Sylvia	394 feet from Euclid avenue.
Urban	226 feet from Rockdale avenue.
Verona	417 feet from Euclid avenue.
Verona	460 feet from Euclid avenue.
Winnepurkit ave.	323 feet from Holyoke street.
Winnepurkit ave.	666 feet from Holyoke street.
Windsor . . .	986 feet from Boylston street.
Woodland . . .	387 feet from Eastern avenue.
Woodland . . .	911 feet from Eastern avenue.
Woodlawn . . .	Corner Winthrop street.

TABLE VII.

SHOWING THE LEAKS IN PIPES AND HYDRANTS, 1892.

MONTH.	SIZE OF MAINS.						Hydrants.
	16 in.	12 in.	10 in.	8 in.	6 in.	4 in.	
January	...	...	...	...	2	...	...
February	...	...	...	...	...	3	...
March	...	...	...	...	1	...	...
April	...	...	...	1	3	7	4
May	...	...	2	...	6	4	10
June	...	1	2	2	7	7	1
July	...	...	1	...	7	5	...
August	...	...	...	...	5	8	1
September	...	...	...	...	3	6	...
October	...	...	1	1	6	3	...
November	...	1	1	...	7	9	2
December	1	...	1	...	8	10	10
Totals	1	2	8	4	55	62	28

TABLE VIII.

SHOWING THE KIND, SIZE AND NUMBER OF WATER METERS IN USE IN 1892.

KIND.	½	⅝	¾	1	1¼	1½	2	4	3	Tot'l.
Thomson	...	42	59	40	...	10	3	1	1	156
Ball & Fitts	..	38	59	22	...	2	...	...	...	121
Worthington	...	18	36	40	3	2	13	...	1	113
Union	...	...	13	15	...	6	9	10	...	53
Crown	1	1	13	6	...	2	...	...	...	23
Weir	1	...	1	3	...	2	...	...	...	7
Nash	...	2	3	1	...	...	...	...	...	6
Niagara	...	...	...	4	...	...	...	...	...	4
Neptune	...	...	3	...	...	...	...	...	...	3
Empire	...	...	...	...	...	...	2	...	...	2
Gem	...	...	...	...	...	...	1	...	...	1
Hersey	...	...	1	...	...	...	...	...	...	1
Frost	...	...	1	...	...	...	...	...	...	1
Motors	...	...	...	...	...	...	...	...	...	3
Totals	2	101	189	131	3	24	28	11	2	494

Total gallons metered, 209,245,000.

TABLE IX.

SHOWING THE NUMBER, SIZE AND LENGTH OF SERVICES LAID IN 1892.

MONTH.	SIZE AND LENGTH OF PIPE.																TOTAL.	
	6 in.		4 in.		3 in.		2 in.		1½ in.		1¼ in.		1 in.		¾ in.			
	No.	Feet.	No.	Feet.	No.	Feet.	No.	Feet.	No.	Feet.	No.	Feet.	No.	Feet.	No.	Feet.	No.	Feet.
January	. .	. . . . .	. .	. . . . .	. .	. . . . .	. .	. . . . .	. .	. . . . .	1	20.2	. .	. . . . .	3	98.6	4	118.8
February	. .	. . . . .	. .	. . . . .	. .	. . . . .	. .	. . . . .	. .	. . . . .	. .	. . . . .	1	31.3	. .	. . . . .	1	31.3
March	. .	. . . . .	. .	. . . . .	. .	. . . . .	. .	. . . . .	1	35.6	. .	. . . . .	. .	. . . . .	1	24.8	2	60.2
April	. .	. . . . .	. .	. . . . .	. .	. . . . .	2	41.9	1	10	1	252	19	980.9	31	1,089	54	2,373.6
May	. .	. . . . .	. .	. . . . .	. .	. . . .	. .	. . . . .	1	19.10	1	22.6	31	1,153.3	33	1,053.5	66	2,249
June	. .	. . . . .	. .	. . . . .	. .	. . . . .	3	90	1	15.4	. .	. . . . .	36	1,555.5	25	796.7	65	2,457.4
July	1	69	2	22.2	. .	. . . . .	1	24.7	1	199.7	4	431.11	29	1,126.8	37	1,430.3	77	3,304.2
August	1	172.11	2	56.2	. .	. . . . .	2	47.9	2	214.8	4	162.6	21	1,033.10	41	1,523.4	73	3,211.2
September	. .	. . . . .	. .	. . . . .	. .	. . . . .	1	36.9	. .	. . . . .	3	235.5	38	1,744	36	1,135.9	78	3,151.11
October	. .	. . . . .	1	17.4	1	84.4	1	151.6	2	60.7	4	500.6	31	1,715.11	36	1,510.10	76	4,041
November	1	14.11	1	31.6	. .	. . . . .	.	. . . .	1	26.2	2	270.9	40	2,012.3	45	1,542.1	90	3,897.8
December	1	25.6	6	206.7	. .	. . . . .	. .	. . . . .	2	229.11	2	254.4	20	865.8	31	1,160,10	62	2,742,10
Totals	4	282.4	12	333.9	1	84.4	10	392.4	14	811.7	22	2,150.1	266	12,219	319	11,365.3	648	27,638.8

TABLE X.

SHOWING THE AMOUNT AND SIZE OF CAST-IRON PIPE LAID IN 1892.

WHERE LAID.	20 in.	16 in.	14 in.	12 in.	10 in.	8 in.	6 in.	4 in.
Adams avenue								167
Allen avenue							272	
Amory								441
Archer							433	
Aspen								267
Boston	44							
Cedar	796							
Central avenue	950							
City Hall square	440							
Centre		*819						
Circuit avenue								417
Cooper						252	260	
Cowdrey avenue							653	
Eastern avenue					229			
Elizabeth avenue								407
Elsmere place								218
Erie							266	
Elmwood avenue								445
Fairchild						1,376		
Fuller								145
Garfield avenue							707	
Glenwood							464	
Goodrich							146	
Grant						198		
Herschel							134	
Harrison court								*424

TABLE X.—CONTINUED.

WHERE LAID.	20 in.	16 in.	14 in.	12 in.	10 in.	8 in.	6 in.	4 in.
Hathaway	....	....	....	....	....	....	....	515
Ida	....	....	....	....	....	....	187	....
Jones court	....	....	....	....	....	....	....	198
King's Beach Terrace	....	....	....	....	....	....	....	567
Lake View avenue	....	....	....	....	....	....	872	....
Laurel	....	....	....	....	....	....	....	197
Linwood	....	....	....	....	....	....	858	....
Liberty	425	....	....	....	....	....	....	....
Mall	1,353	....	....	....	....	....	....	....
Miller's court	....	....	....	....	....	....	....	319
Morrill court	....	....	....	....	....	....	....	92
North Common	2,682	....	....	....	....	....	....	....
Newcomb avenue	....	....	....	....	....	....	....	152
Oakville	....	....	....	....	....	....	696	....
Ocean Terrace	....	....	....	....	....	....	....	320
Ontario	....	....	....	....	....	....	96	....
Orchard	....	....	....	....	....	....	743	....
Pleasant	....	....	....	....	280	*876	80	....
Pleasant View avenue	....	....	....	....	....	....	....	265
Pitkin	....	....	....	....	....	....	....	598
Ray	....	....	....	....	....	....	....	249
Rhodes avenue	....	....	....	....	....	....	....	400
Safford	....	....	....	....	....	....	....	711
Springfield avenue	....	....	....	....	....	....	241	....
Sherbrook place	....	....	....	....	....	....	17	373
Sylvia	....	....	....	....	....	....	468	224
Sterling	....	....	....	....	....	....	948	....
State	....	....	....	....	*766	....	....	....

TABLE X.—CONTINUED.

WHERE LAID.	20 in.	16 in.	14 in.	12 in.	10 in.	8 in.	6 in.	4 in.
Suffolk	....	....	....	....	....	....	*761	....
Urban	....	....	....	....	....	....	....	243
Verona	....	....	....	....	....	....	....	1,036
Walnut	1,420	....	....	....	....	....	....	....
Western avenue	....	....	....	....	*18	162 *368	....	....
Winnepurkit avenue	....	....	....	....	....	....	699	....
Winthrop	....	....	....	....	....	....	....	212
Windsor avenue	....	....	....	....	....	....	....	461
Winter	847	....	....	....	....	....	....	....
Woodlawn	....	....	....	....	....	....	123	....
Woodland avenue	....	....	....	....	....	....	948	....
Totals	8,957	819	....	....	1,293	3,232	11,072	10,063

* Relaid.

35,436 feet pipe 4 inches and larger.
1,357 feet pipe 2 inches and smaller.
4,392 feet relaid.

TABLE XI.

SHOWING THE AMOUNT AND SIZE OF CEMENT-LINED PIPE LAID IN 1892.

WHERE LAID.	2 in.	1½ in.	1¼ in.
Brownville avenue	....	....	70
Churchill place	....	300	....
Dearborn court	167	....	....
Dell's court	200	243	....
Lewis court	....	243	....
Mapleton place	188	....	....
Pike's court	189	....	....
Totals	744	543	70

	MILES.	FEET.
Total pipe laid in 1892	6	5,113
Cement pipe taken up and replaced with cast-iron		4,392
Cement pipe discontinued on line 20 inch main	1	3,177
Total extension	4	2,824
Previously laid	98	3,653
Laid to January 1, 1893	103	1,197
Private pipe in Swampscott		1,788
Pipe in Saugus	12	1,876
Total supplied by works	115	4,861

TABLE XII.

RECORD OF THE LEAVITT ENGINE FOR THE YEAR ENDING DECEMBER 31, 1892.

DATE.	Number of pumping days.	Total pumping time per month.	Average pumping time per day.	Number of revolutions per month.	Average revolutions per minute.	COAL CONSUMED.						Gallons pumped per month allowing 4 per cent. for loss of action in pump.	Average number of gals. pumped per lb. of coal.	Average number of gallons raised 100 feet high per pound of coal.	Average head against the pump.	Average duty in lbs. of water raised 1 foot high per 100 lbs. of coal, no deduction for ashes.	Average duty in lbs. of water raised 1 foot high per 100 lbs. of coal, the ashes deducted.	Oil.	Waste.
						Raising steam.	Pumping.	Banking.	Total.	Ashes.									
Month.	Days.	H. M.	H. M.	Rev.	Rev.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	P.ct.	Gals.	Gals.	Gals.	Feet.	Lbs.	Lbs.	Gals.	Lbs.
January . .	. .	. . .	. .	. . . . .	. .	. .	. . .	. .	. . . .	. .	.	. . . . . .	. .	. . .	. .	. . . . .	. . . . . .	. .	10
February .	. .	. . .	. .	. . . . .	. .	. .	. . .	. .	. . . .	. .	.	. . . . . .	. .	. . .	. .	. . . . .	. . . . . .	. .	25
March . .	. .	. . .	. .	. . . . .	. .	. .	. . .	. .	. . . .	. .	.	. . . . . .	. .	. . .	. .	. . . . .	. . . . . .	. .	20
April . . .	. .	. . .	. .	. . . . .	. .	. .	. . .	. .	. . . .	. .	.	. . . . . .	. .	. . .	. .	. . . . .	. . . . . .	. .	10
May . . .	19	359.50	18.56	374,750	17.51	2,700	84,300	1,200	88,200	8,370	9.50	69,909,613	792.7	1,278.77	161.42	106,706,704	118,042,535	10	25
June . . .	. .	. . .	. .	. . . . .	. .	. .	. . .	. .	. . . .	. .	.	. . . . . .	. .	. . .	. .	. . . . .	. . . . . .	. .	10
July	27	578	21.24	631,450	18.20	2,400	139,750	1,000	143,150	13,060	9.13	117,796,996	822.9	1,319.02	160.29	110,005,740	121,142,563	30	30
August . .	. .	. . .	. .	. . . . .	. .	. .	. . .	. .	. . . .	. .	.	. . . . . .	. .	. . .	. .	. . . . .	. . . . . .	. .	20
September.	. .	. . .	. .	. . . . .	. .	. .	. . .	. .	. . . .	. .	.	. . . . . .	. .	. . .	. .	. . . . .	. . . . . .	. .	20
October . .	1	22	22	23,200	17.50	900	5,500	. .	6,400	500	7.93	4,327,960	676.2	1,070.28	158.28	89,267,907	98,502,519	2	20
November.	26	516.25	19.51	557,450	17.99	2,800	128,800	1,600	133,200	12,620	9.39	103,992,295	780.7	1,258.95	161.26	105,000,086	115,989,480	30	25
December.	27	547.50	20.17	594,900	18.10	2,500	138,200	1,600	142,300	13,725	9.56	110,078,595	779.8	1,257.65	162.55	105,787,349	117,013,431	30	30
Totals and Averages.	100	2,024.05	20.24	2,181,750	17.96	11,300	496,550	5,400	513,250	48,275	9.34	407,005,464	793	1,280.21	161.44	106,769,871	117,426,999	102	245

TABLE XIII.

RECORD OF THE LORETZ ENGINE FOR THE YEAR ENDING DECEMBER 31, 192.

DATE.	Number of pumping days.	Total pumping time per month.	Average pumping time per day.	Number of revolutions per month.	Average revolutions per minute.	COAL CONSUMED.						Gallons pumped per month allowing per cent. for loss of action in pump.	Average number of gals. pumped per lb. of coal.	Average number of gallons raised 100 feet high per pound of coal.	Average head against the pump.	Average duty in lbs. of water raised 1 foot high per 100 lbs. of coal, no deduction for ashes.	Average duty in lbs. of water raised 1 foot high per 100 lbs. of coal, the ashes deducted.	Oil.	Waste.
						Raising steam.	Pumping.	Banking.	Total.	Ashes.									
Month.	Days	H. M.	H. M.	Rev.	Rev.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	P.ct.	Gals.	Gals.	Gals.	Feet.	Lbs.	Lbs,	Gals.	Lbs.
January . .	26	387.40	14.54	508,050	21.41	11,200	128,950	4,200	144,350	12,610	8.58	104,424,597	723.4	1,115,41	154.19	93,028,350	101,173,845	30	75
February .	28	406	14.30	488,900	20.06	13,100	116,500	6,300	135,900	12,530	9.22	100,488,506	739.4	1,141.63	154.40	95,216,075	104,971,726	37	75
March . .	31	436.50	14.54	514,700	19.63	15,600	122,050	7,800	145,450	12,570	8.64	105,791,438	727.3	1,132.47	155.71	94,453,781	103,388,790	32	70
April . . .	27	424.05	15.42	496,300	19.50	10,700	124,750	4,500	139,950	11,160	7.94	102,009,502	728.9	1,146.41	157.28	95,610,871	103,976,543	25	50
May . . .	8	100.45	12.35	135,600	22.43	5,300	35,150	2,100	42,550	3,240	7.56	27,871,224	655	1,022.06	156.04	85,242,949	92,504,144	10	70
June . . .	27	327.30	12.07	544,100	27.89	13,800	143,000	6,900	163,700	15,710	9.54	113,445,117	693	1,087.24	156.89	90,677,271	100,303,190	33	60
July	. .	. . .	. .	. . . . .	. .	. .	. . . . .	. .	. . . . .	. . .	.	. . . . . .	. .	. . .	. .	. . . . .	. . . . . .	. .	20
August . .	27	343	12.42	580,300	28.19	7,933	145,750	6,900	160,583	14,800	9.22	121,282,700	755.2	1,179.40	156.17	98,370,063	108,455,611	40	30
September.	26	294.05	11.18	528,300	29.94	8,200	134,650	78,00	150,650	13,770	9.14	110,414,700	732.8	1,154.08	157.49	96,266,857	105,951,213	35	40
October . .	24	287	11.57	508,650	29.53	10,000	127,100	6,000	143,100	12,050	8.42	106,307,850	742.8	1,174.96	158.18	98,003,892	107,097,036	25	35
November.	. .	. . .	. .	. . . . .	. .	. .	. . . . .	. .	. . . . .	. . .	.	. . . . . .	. .	. . .	. .	. . . . .	. . . . . .	. .	35
December .	. .	. . .	. .	. . . . .	. .	. .	. . . . .	. .	. . . . .	. . .	.	. . . . . .	. .	. . .	. .	. . . . .	. . . . . .	. .	30
Totals and Averages.	224	3,006.55	13.24	4,304,900	24.28	95,833	1,077,900	52,500	1,226,233	108,440	8.84	892,035,634	727.4	1,136.70	156.27	94,809,202	104,056,596	267	590

Meteorological Record for January, 1892.

	8 A. M.		1 P. M.		6 P. M.		24 HOURS ENDING 8 A. M.				
Date.	Barometer.	Thermometer.	Barometer.	Thermometer.	Barometer.	Thermometer.	Maximum Thermometer.	Minimum Thermometer.	Daily Range.	Daily Mean.	Rainfall.
1	30.43	25.0°	30.37	38.5°	30.29	36.5°	42.0°	24.0°	18.0°	33.00°	....
2	29.98	42.5	29.76	46.0	29.70	45.0	49.0	49.0	9.0	44.50	0.76
3	29.55	41.0	29.59	44.5	29.64	35.0	45.0	24.0	21.0	34.50	....
4	29.57	24.0	29.51	30.0	29.53	25.0	31.0	18.0	13.0	24.50	....
5	29.62	21.0	29.65	29.0	29.90	25.0	31.0	18.0	13.0	24.50	....
6	29.75	23.0	29.55	32.0	29.36	35.0	37.5	22.0	15.5	29.75	*0.41
7	29.40	25.5	29.51	30.0	26.69	25.0	31.0	17.0	14.0	24.00	0.03
8	30.01	22.0	30.03	31.0	30.05	27.0	31.5	16.5	15.0	24.00	....
9	30.21	27.0	30.23	38.0	30.24	29.0	39.0	13.5	25.5	26.25	....
10	30.47	18.0	30.54	29.5	30.55	24.0	30.0	17.0	13.0	23.50	....
11	30.57	22.0	30.57	27.0	30.55	29.0	30.0	21.0	19.0	25.50	....
12	30.46	21.0	30.40	35.0	30.38	33.0	39.0	30.0	9.0	44.50	0.94
13	30.19	39.0	30.07	41.0	30.06	38.5	49.0	37.0	12.0	43.00	*0.41
14	29.97	49.0	29.88	58.0	29.88	58.5	59.0	37.0	22.0	48.00	0.18
15	30.10	37.0	30.06	35.5	30.06	30.0	37.0	14.0	23.0	25.00	0.33
16	30.29	17.0	30.42	25.0	30.47	19.5	25.0	8.0	17.0	16.50	....
17	30.61	11.0	30.63	27.0	30.60	27.0	31.0	10.5	21.5	25.75	....
18	30.48	31.0	30.39	39.0	30.30	37.0	69.0	31.0	38.0	50.00	0.72
19	29.73	45.5	29.74	42.0	29.81	32.0	47.0	11.0	36.0	29.00	*0.22
20	30.13	11.5	30.17	18.0	30.21	14.0	19.0	8.0	11.0	13.50	....
21	30.18	15.0	30.04	25.0	30.09	22.0	27.0	12.0	15.0	19.50	....
22	30.28	17.0	30.28	28.0	30.18	29.0	34.0	16.0	24.0	25.00	....
23	29.80	31.5	29.72	39.0	29.70	35.0	41.5	11.0	30.5	26.25	....
24	29.79	17.5	29.77	29.0	29.71	26.0	34.0	17.0	17.0	25.50	*0.01
25	29.52	34.0	29.45	40.0	29.43	37.0	42.0	30.0	12.0	36.00	....
26	29.39	30.0	29.47	16.0	29.55	8.0	30.0	3.0	27.0	16.50	*0.01
27	29.79	11.0	29.85	18.5	29.95	17.0	20.0	9.0	11.0	14.50	....
28	29.97	19.0	29.86	29.5	29.84	28.0	31.0	18.0	13.0	24.50	....
29	29.84	29.0	29.81	35.0	29.80	35.0	37.0	28.0	9.0	32.50	....
30	29.91	34.0	29.95	30.0	29.98	25.0	35.0	14.0	21.0	24.50	....
31	29.90	20.0	29.85	36.0	29.86	29.5	37.0	20.0	17.0	28.50	....

Monthly range . . . . 66.0°
Monthly mean . . . . 28.48°
Monthly rainfall 4.02

*Snow

Meteorological Record for February, 1892.

	8 A. M.		1 P. M.		6 P. M.		24 HOURS ENDING 8 A. M.				
Date.	Barometer.	Thermometer.	Barometer.	Thermometer.	Barometer.	Thermometer.	Maximum Thermometer.	Minimum Thermometer.	Daily Range.	Daily Mean.	Rainfall.
1	29.93	27.0°	29.89	38.0°	29.88	37.0°	40.0°	27.0°	13.0°	33.50°	....
2	30.02	35.0	30.0	40.0	29.98	34.5	42.0	33 0	9.0	37.50	*0.69
3	29.72	35.0	29.73	35 0	29.78	32.0	37.5	26.5	11.0	32.00	*0.05
4	29.89	30.5	29 88	38 5	29.90	29.0	40 0	13.0	27.0	26.50	....
5	29.96	18.0	29 93	29.0	29.90	24.0	34.0	8.0	26 0	21.00	....
6	30.16	12.0	30 24	24.0	30.26	20.0	24.5	10.5	14.5	17.50	....
7	30.29	16.5	30.20	35 0	30.0	31.5	37.0	17.0	20 0	27.00	*0.27
8	29.65	30.0	29 63	35.0	29.68	32.0	36.0	26.0	10 0	31.00	*0.01
9	29.83	29.0	29.82	35.0	29 82	30.0	37.0	20 0	17.0	28.50	....
10	29.97	24.0	29.99	30.0	29.96	25.0	33 0	23.0	10.0	28.00	*0 09
11	29 62	33.0	29 33	34.5	29.08	34.0	35.0	27.0	8.0	31.00	*0.82
12	29.12	29 0	29.15	40.0	29 23	27.0	41.0	8.5	32.5	24 75	....
13	29 51	12.0	29.54	19.0	29 64	16.0	21.0	8.0	13.0	14.50	....
14	29 96	13 5	29.99	29 0	29 97	30.0	41.0	13.0	28.0	27 00	0.11
15	29 73	41.0	29.87	41 0	30.02	34.0	45.0	16.0	29.0	30.50	....
16	30.44	21.0	30.46	23.0	30.45	19 0	24.0	3.5	20.5	13.75	....
17	30 50	9 0	30.48	18 0	30.43	16.0	19.0	6 0	13.0	12.50	....
18	30.15	19.0	30 05	34 0	30.06	32.0	36 0	18 0	18.0	27.00	....
19	30 29	29.0	30 30	39 0	30.30	35.0	39.5	28.5	11.0	34.00	....
20	30.37	36.5	30 38	40 0	30.42	37.0	43.5	34.0	9.5	38.75	....
21	30.45	36.0	30 46	36.5	30.46	34.0	37.5	34.0	3 5	35.75	....
22	30.48	36 5	30.50	40.0	30.50	34.0	42.0	30.0	12.0	36.00	....
23	30.50	36.0	30.52	39.0	30.52	35.0	42.0	33.0	9.0	37.50	*0 08
24	30.52	37.0	30.49	42.0	30.46	37.0	50.0	32.0	18.0	41.00	0 01
25	30 33	38 0	30.31	42 0	30.27	38 0	45.0	35 0	10.0	40 00	....
26	30 24	38 0	30.37	43.0	30.28	40.0	45.0	23.0	22.0	34.00	....
27	30.57	24.0	30.66	23 0	30.68	21.0	25.0	11.5	1.35	18.25	....
28	30.71	13 5	30.68	22.0	30 63	23 0	27.0	12.0	25.0	19.50	....
29	30.41	27.0	30 36	34.0	30.32	32.0	36 0	26.0	10.0	31.00	....

Monthly range . . . . 46.5°
Monthly mean . . . . 28 59°
Monthly rainfall 2.13

*Snow.

Meteorological Record for March, 1892.

	8 A. M.		1 P. M.		6 P. M.		24 HOURS ENDING 8 A. M.				
Date.	Barometer.	Thermometer.	Barometer.	Thermometer.	Barometer.	Thermometer.	Maximum Thermometer.	Minimum Thermometer.	Daily Range.	Daily Mean.	Rainfall.
1	30.21	35.0°	30.20	34.5°	30.14	33.0°	37.0°	18.0°	9.0°	27.50	•0.10
2	30.22	21.0	30.25	22.0	30.24	18.0	26.0	16.0	10.0	21.00	•0.05
3	29.98	17.0	29.89	25.0	29.84	25.0	30.0	17.0	13.0	23.50	•0.01
4	29.77	30.0	29.73	36.5	29.68	34.0	38.0	21.0	17.0	29.50	....
5	29.67	31.0	29.63	38.0	29.60	35.0	40.0	25.0	15.0	32.50	....
6	29.61	33.5	29.62	38.5	29.67	36.0	40.5	28.5	12.0	34.50	....
7	29.78	36.0	29.76	42.5	29.75	41.5	45.0	28.0	17.0	36.50	....
8	29.81	39.0	29.74	40.5	29.59	37.0	45.0	35.0	10.0	40.00	0.54
9	29.36	37.0	29.36	44.0	29.36	43.0	48.0	31.0	17.0	39.50	....
10	29.75	40.5	29.74	48.0	29.66	42.0	51.0	30.0	21.0	40.50	0.25
11	29.38	32.0	29.36	33.0	29.39	29.0	35.0	19.0	16.0	27.00	....
12	29.65	26.0	29.64	34.0	29.63	33.0	35.5	19.0	16.5	27.25	....
13	29.83	26.5	29.84	31.0	29.82	24.5	31.0	13.0	18.0	22.00	....
14	29.86	20.0	29.87	24.0	29.88	22.0	27.0	14.0	13.0	20.50	....
15	30.13	24.0	30.13	30.0	30.14	27.0	31.0	14.0	17.0	22.50	....
16	30.33	25.0	30.32	32.0	30.28	28.0	34.0	16.0	18.0	25.00	....
17	30.27	26.0	30.26	33.0	30.22	32.0	35.0	24.0	11.0	29.50	•0.31
18	30.06	28.5	29.85	33.0	29.66	34.0	35.0	28.0	7.0	31.50	•0.34
19	29.25	32.0	29.33	36.0	29.47	31.0	37.0	26.0	11.0	31.50	....
20	29.70	33.0	29.74	37.5	29.86	27.5	39.0	14.0	25.0	26.50	....
21	30.20	28.5	30.25	31.5	30.25	29.5	33.0	17.0	16.0	25.00	....
22	30.40	33.0	30.42	37.0	30.37	32.0	42.0	30.0	12.0	36.00	....
23	30.16	35.0	29.92	40.0	29.81	43.0	43.0	31.0	12.0	37.00	•0.09
24	30.00	40.0	30.00	42.0	29.98	40.0	45.0	30.0	15.0	57.00	0.24
25	30.01	40.0	29.98	45.0	29.94	40.0	47.0	28.0	19.0	37.50	....
26	29.97	33.0	29.90	42.0	29.84	38.0	43.5	32.0	11.5	37.75	....
27	29.71	38.5	29.63	39.0	29.57	35.0	40.0	30.0	10.0	35.00	....
28	29.70	40.0	29.70	47.0	29.71	42.0	49.0	31.0	18.0	40.00	....
29	29.93	41.0	29.96	43.0	29.96	40.0	43.0	28.0	15.0	35.50	....
30	30.19	41.0	30.20	38.5	30.20	36.0	43.0	26.0	17.0	34.50	....
31	30.36	40.0	30.40	41.0	29.41	39.0	44.0	27.0	17.0	35.50	....

Monthly range	38.0		
Monthly mean		31.27°	
Monthly rainfall			1.93

•Snow.

Meteorological Record for April, 1892.

	8 A. M.		1 P. M.		6 P. M.		24 HOURS ENDING 8 A. M.				
Date.	Barometer.	Thermometer.	Barometer.	Thermometer.	Barometer.	Thermometer.	Maximum Thermometer.	Minimum Thermometer.	Daily Range.	Daily Mean.	Rainfall.
1	30.50	43 0°	30.50	46.0°	30.45	45.0°	50.0°	34.0°	16.0°	42.00°	....
2	30.35	58 0	30.24	62.0	30.14	60.0	65.5	46.5	9.0	56.00	....
3	29.99	62.5	29.88	71.0	29.86	65 0	73.0	50.0	23.0	61.50	....
4	30.00	52.0	29.97	63.5	29.94	51.0	66.0	47.0	19.0	56.60	....
5	29.96	51.0	29.95	54.0	29 88	44.0	64.0	41.0	23.0	52.50	....
6	29.69	64.0	29.67	70.0	29.71	58.0	71.5	34.0	37.5	52.75	....
7	29.94	50.0	29.95	57.0	29.76	57.0	61.0	42.0	19.0	51.50	....
8	29.71	51.0	29.64	52.5	29.58	55.0	58.0	44.0	14.0	51.00	0.02
9	29.50	58.0	29.48	53.0	29 49	46.0	55.0	30.5	24.5	42.75	....
10	25.49	45.0	29.49	50.0	29.56	41.0	52.0	32.0	20.0	42.00	....
11	29.73	42.0	29.74	46.0	29.78	42.0	47.0	27.0	20.0	37.00	....
12	29.94	40.0	29.93	42.0	29.92	40.0	46.0	29.0	17.0	37.50	....
13	29 97	43.0	29.94	50 0	29.93	47.0	53.5	31.0	22.5	42.25	....
14	30.00	44.5	29.95	53.0	29.88	46.0	55.0	39.0	16.0	47.00	....
15	29.65	43.0	29.66	45.0	29 64	40.0	49.0	33.0	16.0	41.00	....
16	29.73	49 0	29.72	51.0	29.72	48.0	55 0	29.0	26.0	42.00	....
17	29.86	46.0	29.83	50.0	29.82	48.0	53.5	32.5	21.0	43.00	....
18	29.88	50.0	29.86	43.5	29.86	41.0	51.0	34.0	17.0	42.50	....
19	30.07	49.0	30.13	53.5	30.21	46.0	57.0	37.0	20.0	47.00	....
20	30.38	57.0	30.38	56.0	30.35	52 0	59.0	36.0	23.0	47.50	....
21	30.36	56.0	30.33	54.0	30.28	50.0	59.0	43.0	16.0	51.00	0.37
22	29.93	59.0	29.91	58.5	29.83	55.0	64.0	50.0	14.0	57.00	0.13
23	29.73	60.0	29.78	62.0	29.94	55.0	64.0	40.5	23.5	52.25	....
24	30.02	61.5	30.06	60.5	30.11	53.5	63.0	28.0	35.0	45.50	....
25	30.48	42.0	30.45	42.5	30.38	42.0	52.0	32.0	20.0	42.00	....
26	30.39	52.0	30.38	48.0	30.33	47.0	54.0	36.0	18.0	45.00	....
27	30.43	52.0	30.43	44.0	30.40	43.0	52.0	38.0	14.0	45.00	....
28	30.30	44.0	30.19	48 0	29.99	48.0	50.0	44.0	6.0	47.00	....
29	29.88	50.0	29.89	54.0	29.90	47.0	57.0	37.0	20.0	47.00	0.09
30	30.14	55 0	30.15	56.0	30.22	49.0	59.0	34.0	25 0	46.50	0.07

Monthly range	46.0°
Monthly mean	43.12°
Monthly rainfall	.68

Meteorological Record for May, 1892.

	8 A. M.		1 P. M.		6 P. M.		24 HOURS ENDING 8 A. M.				
Date.	Barometer.	Thermometer.	Barometer.	Thermometer.	Barometer.	Thermometer.	Maximum Thermometer.	Minimum Thermometer.	Daily Range.	Daily Mean.	Rainfall.
1	30.39	46.0	30.27	55.0	30.10	49.5	64.0	46.0	18.0	55.00	....
2	29.92	64.0	29.91	67.0	29.90	50.0	70.5	45.0	25.5	57.75	0.20
3	30.08	46.5	30.15	50.5	30.16	43.0	53.0	42.0	11.0	47.50	0.54
4	30.02	49.0	29.96	54.0	29.90	58.0	62.0	48.0	14.0	55.00	....
5	30.19	56.0	30.18	60.0	30.12	63.0	65.0	50.0	15.0	57.50	....
6	30.01	55.0	29.90	60.0	29.83	57.0	67.0	46.0	21.0	56.50	....
7	29.81	59.0	29.75	58.0	29.73	51.0	60.0	39.0	21.0	49.80	....
8	29.90	55.0	29.96	61.0	30.08	57.0	63.0	48.0	15.0	55.50	....
9	30.19	57.5	30.18	52.0	30.15	52.0	61.0	44.0	17.0	52.50	....
10	30.17	58.0	30.16	52.0	30.09	52.0	61.0	45.0	16.0	53.00	....
11	29.95	52.0	29.86	52.0	29.68	50.0	57.0	48.0	9.0	52.50	0.50
12	29.76	51.0	29.83	52.0	29.87	50.0	56.0	48.0	8.0	52.00	0.05
13	30.16	54.0	30.24	59.0	30.27	50.0	62.0	47.0	5.0	54.50	....
14	30.35	62.0	30.34	55.0	30.33	59.0	64.5	48.5	16.0	56.75	0.43
15	30.27	50.0	30.18	48.5	30.04	49.5	65.0	48.0	17.0	56.50	0.90
16	29.88	63.0	29.84	72.5	29.86	67.0	75.0	50.0	25.0	62.50	....
17	30.10	68.0	30.06	67.0	29.96	68.0	72.0	52.0	20.0	62.00	....
18	30.00	67.0	29.97	68.0	29.97	55.0	70.0	44.0	26.0	57.00	....
19	30.08	55.0	30.06	50.0	30.01	47.5	56.0	43.0	13.0	49.50	0.39
20	29.88	43.0	29.92	47.0	30.06	44.0	47.0	40.0	7.0	43.50	0.31
21	30.16	45.5	30.15	43.5	30.08	43.0	49.5	43.0	6.5	46.25	1.13
22	29.81	49.5	29.83	58.0	29.84	50.0	59.0	44.0	19.0	51.50	0.31
23	59.53	45.0	29.51	56.0	29.54	56.0	63.0	46.0	17.0	54.50	....
24	29.67	63.0	29.69	63.5	29.72	64.0	67.0	51.0	16.0	59.00	....
25	29.85	66.0	29.81	72.5	29.77	68.0	74.0	55.0	19.0	64.50	0.22
26	29.79	60.0	29.78	75.0	29.73	69.0	75.0	55.0	20.0	65.00	....
27	29.53	65.0	29.50	63.0	29.52	65.0	69.0	52.0	17.0	60.50	0.25
28	29.72	65.0	29.78	69.5	29.82	68.0	70.0	60.5	9.5	62.25	....
29	30.02	68.5	30.03	68.0	30.01	64.5	72.0	57.0	15.0	64.50	....
30	30.08	66.5	30.10	74.0	30.13	64.5	76.0	60.0	16.0	68.00	....
31	30.21	71.0	30.22	71.0	30.20	65.5	77.0	59.0	18.0	68.00	....

Monthly range	38.0		
Monthly mean		56.57	
Monthly rainfall			5.23

Meteorological Record for June, 1892.

	8 A. M.		I P. M.		6 P. M.		24 HOURS ENDING 8 A. M.				
Date.	Barometer.	Thermometer.	Barometer.	Thermometer.	Barometer.	Thermometer.	Maximum Thermometer.	Minimum Thermometer.	Daily Range.	Daily Mean.	Rainfall.
1	30 23	72 0°	30.18	84.0°	30 10	82.5°	85.5°	65.5°	20 0°	75.50°	....
2	30 03	83.0	29 97	86 0	29 92	86 0	89 0	69.0	20.0	79 00	....
3	30.02	71.0	30.12	72.5	30 14	65.0	75.0	55.0	20.0	65 00	0.16
4	30.39	64.0	30 40	62.0	30.40	57.0	65 5	54 0	11.5	59 79	....
5	30.36	64 0	30 24	75 0	30.15	68 0	77.0	62.0	15.0	64 50	....
6	29 94	76 0	29.86	81 0	29 84	76 0	82 0	64.0	18.0	73 00	....
7	30.10	69.0	30 15	62.5	30 14	62 0	74.0	52.0	22.0	63.00	....
8	30 22	72.0	30 21	73 0	30 14	66 0	77.0	55.0	22 0	66.00	0.12
9	30.00	59 0	29.90	65.0	29.83	65.0	72.0	53.0	19.0	62.50	0.11
10	29.98	57.0	30 00	57.5	29 98	54 0	73.0	44.0	29 0	58 50	....
11	30.02	72.0	30.00	72.0	29.94	74 0	83.0	55.0	28 0	69.00	....
12	29.91	82.5	29 88	83.0	29 88	83.0	88.0	66.0	22.0	77.00	....
13	29.96	87 0	29 93	90.0	29 89	88.0	91.0	72.0	19.0	81.50	....
14	29 86	88 0	29.82	90.0	29.71	85.0	92.5	62.5	30 0	77 50	0.14
15	30.02	75.0	30 06	71 0	30.06	68.0	77.0	56.0	21.0	66.50	....
16	30.14	74.0	30.11	76.0	30.06	73 0	86.5	68.5	18.0	77.50	....
17	30 06	86.0	30 00	91 0	30.12	65.0	93.0	59.0	34.0	70 00	1.35
18	30.28	66.0	30.29	69.0	30.22	59.0	70.5	56.5	14.0	63.50	....
19	30.09	62.0	29.95	71.5	29.83	72.0	77.0	62.0	15.0	64.50	....
20	29 62	77.0	29.58	81.0	29.58	83.0	86.0	66.0	20 0	76.00	....
21	29.70	85.0	29.67	87.0	29 62	85.0	88.0	70.0	18.0	79.00	....
22	29 65	82.0	29 62	78 0	29.63	80.0	85 0	66.0	19.0	75.50	....
23	29 80	79 0	29.78	79 0	29.76	69.0	83.0	59 0	24.0	71.00	.05
24	29.94	61.0	29.99	68.0	29.98	64.0	73.0	57.0	16.0	65 00	0 62
25	29.94	62.0	29.93	67.0	29.92	61.0	71.0	52.0	19.0	61.50	0.24
26	30 03	63 0	30.02	72.0	30 00	61.5	74 0	59.0	15.0	66.50	0.24
27	30.02	62.5	30.00	68 0	29.93	63.0	75.0	58.0	17 0	66.50	0 29
28	29 62	73.0	29.62	82.5	29 67	78.0	83.0	59 0	24.0	71.00	....
29	30.00	76.0	29.99	80.0	29.97	74 0	80.0	65.0	15.0	72.50	....
30	29.98	75.0	29 94	77.0	29 89	73.0	81.0	64.0	17.0	72.50	....

Monthly range . . . . 49.00°
Monthly mean . . . . 69 89°
Monthly rainfall 3 22

Meteorological Record for July, 1892.

	8 A. M.		1 P. M.		6 P. M.		24 HOURS ENDING 8 A. M.				
Date.	Barometer.	Thermometer.	Barometer.	Thermometer.	Barometer.	Thermometer.	Maximum Thermometer.	Minimum Thermometer.	Daily Range.	Daily Mean.	Rainfall.
1	30.08	66.0°	30.08	65.0°	30.08	62.5°	77.0°	55.0°	22.0°	66.00°	0.14
2	30.16	74.0	30.16	72.0	30.14	68.0	70.5	62.0	13.5	68.75	0.03
3	29.91	73.0	29.73	80.0	29.66	71.5	81.5	62.0	19.5	71.75	0.58
4	29.85	73.5	30.01	74.0	30.09	71.0	76.0	54.0	22.0	65.00	....
5	30.30	72.0	30.32	65.0	30.30	64.0	82.0	57.0	25.0	69.50	....
6	30.40	75.0	30.44	68.0	30.45	65.0	79.0	55.0	24.0	67.00	....
7	30.48	77.0	30.48	70.5	30.44	71.0	79.0	58.0	21.0	68.50	....
8	30.33	77.0	30.30	7[illegible].0	30.23	66.0	79.0	55.0	24.0	67.00	....
9	30.18	73.5	30.17	72.5	30.10	67.5	79.0	59.5	19.5	69.25	0.28
10	30.10	77.5	30.09	80.0	30.07	82.0	85.0	60.0	25.0	72.50	....
11	30.08	85.0	30.07	81.5	30.02	81.0	87.5	65.5	2[illegible].0	76.50	....
12	30.[illegible]0	85.0	29.96	85.0	29.91	81.0	88.0	66.0	22.0	77.00	....
13	29.88	85.0	29.86	84.0	29.81	81.0	88.0	70.0	18.0	79.00	....
14	29.87	83.0	29.89	83.0	29.88	79.0	89.0	67.0	22.0	78.00	0.13
15	29.94	84.0	29.93	77.0	29.85	78.0	87.0	66.0	21.0	76.50	0.20
16	29.74	77.0	29.78	74.5	29.90	68.0	81.0	50.0	31.0	65.50	....
17	30.09	70.0	30.06	73.5	30.05	71.5	80.0	55.0	25.0	67.50	....
18	30.10	78.0	30.09	77.0	30.06	77.5	79.5	59.5	20.0	69.50	....
19	30.09	77.5	30.06	84.0	30.02	76.5	85.0	66.0	19.0	75.50	....
20	29.92	81.5	29.92	80.5	29.92	76.5	84.0	55.0	29.0	69.50	....
21	30.10	78.0	30.08	75.0	30.08	68.0	79.0	59.0	20.5	69.00	....
22	30.16	78.5	29.97	81.0	29.92	80.0	87.0	67.0	20.0	77.00	....
23	29.91	82.5	29.90	83.0	29.94	80.0	87.0	64.0	23.0	75.50	....
24	30.00	86.5	29.97	89.5	29.94	81.0	90.5	70.5	20.0	80.50	....
25	29.96	86.0	29.96	90.0	29.96	85.0	93.5	71.5	22.0	82.50	....
26	29.93	86.5	29.86	89.0	29.83	88.0	92.5	70.0	22.5	81.25	....
27	29.91	89.0	29.89	87.0	29.84	88.0	91.0	72.0	19.0	81.50	....
28	29.91	85.5	29.91	80.0	29.89	72.5	91.0	66.0	25.0	78.50	....
29	29.97	75.0	29.98	75.0	29.93	69.0	83.0	67.0	16.0	75.00	0.08
30	29.99	78.0	30.04	77.0	30.08	67.0	84.0	69.5	24.5	71.75	....
31	30.12	74.0	30.12	69.0	30.10	61.0	76.0	60.0	16.0	68.00	....

Monthly range	43.50°
Monthly mean	76.14°
Monthly rainfall	1.44

Meteorological Record for August, 1892.

	8 A. M.		1 P. M.		6 P. M.		24 HOURS ENDING 8 A. M.				
Date.	Barometer.	Thermometer.	Barometer.	Thermometer.	Barometer.	Thermometer.	Maximum Thermometer.	Minimum Thermometer.	Daily Range.	Daily Mean.	Rainfall.
1	30.05	63.0°	30.05	66.0°	30.05	61.0°	67.0°	61.0°	64.0°	64.00°	0.81
2	30.06	63.0	30.05	67.0	30.02	65.0	68.0	62.0	6.0	65.00	0.36
3	29.98	66.0	29.98	75.0	29.97	67.5	80.0	60.0	20.0	70.00	....
4	29.96	79.0	29.93	80.0	29.88	79.0	83.0	67.0	16.0	75.00	....
5	29.89	74.0	29.87	73.0	29.84	67.0	79.0	64.0	15.0	71.50	1.40
6	29.85	75.0	29.84	80.0	29.85	70.0	81.5	57.5	24.0	69.50	....
7	30.07	74.5	30.10	73.5	30.10	70.0	76.0	60.0	16.0	68.00	....
8	30.10	74.0	30.05	81.0	30.00	78.0	82.0	68.0	14.0	75.00	....
9	29.92	81.0	29.85	88.0	29.84	85.0	90.0	73.0	17.0	81.50	....
10	29.99	86.0	29.99	85.0	29.95	82.0	89.0	71.0	18.0	80.00	....
11	29.97	80.0	29.99	88.0	29.89	81.0	89.0	69.0	20.0	79.00	1.67
12	29.81	72.0	29.76	80.0	29.78	70.0	81.0	62.0	19.0	71.50	....
13	29.87	68.5	29.87	74.0	29.88	66.0	75.0	60.0	15.0	67.50	....
14	29.94	75.0	29.94	71.0	29.95	69.0	78.0	60.0	18.0	69.00	....
15	30.00	75.0	30.00	77.0	30.00	73.0	80.0	59.0	21.0	69.50	....
16	30.10	75.0	30.10	75.0	30.08	75.5	80.0	62.0	18.0	71.00	....
17	30.12	79.0	30.12	81.0	30.09	80.0	83.0	64.0	19.0	73.50	....
18	30.12	81.0	30.12	82.0	30.11	76.0	83.0	68.0	15.0	75.50	....
19	30.14	74.0	30.12	75.0	30.07	73.0	79.0	64.0	15.0	71.50	....
20	30.02	71.0	30.01	70.5	29.98	65.0	75.0	64.5	10.5	69.75	....
21	29.95	74.5	29.90	72.0	29.88	68.5	79.0	59.0	20.0	69.00	....
22	30.02	75.0	30.04	77.5	30.06	73.0	79.0	58.0	21.0	68.50	....
23	30.26	70.0	30.29	68.5	30.27	65.5	72.0	57.0	15.0	64.50	....
24	30.25	72.0	30.24	71.0	30.17	69.0	77.0	63.0	14.0	70.00	....
25	30.06	71.0	29.96	70.0	29.84	67.0	75.0	58.0	17.0	66.50	....
26	29.94	60.0	30.00	62.0	30.02	58.5	63.0	55.0	8.0	59.00	0.84
27	30.04	56.0	30.03	58.0	30.02	56.0	59.0	55.0	4.0	57.00	0.79
28	30.04	58.0	30.04	68.0	30.05	62.0	70.0	58.0	12.0	64.00	.08
29	30.09	70.0	30.10	70.0	30.10	64.0	71.0	58.0	13.0	64.50	....
30	30.11	68.0	30.11	67.0	30.07	62.0	69.0	59.0	10.0	64.00	....
31	29.98	67.0	29.92	76.0	29.85	68.5	77.0	55.0	22.0	66.00	0.55

Monthly range	35.0°
Monthly mean	69.36°
Monthly rainfall	6.50

Meteorological Record for September, 1892.

	8 A. M.		1 P. M.		6 P. M.		24 HOURS ENDING 8 A. M.				
Date.	Barometer.	Thermometer.	Barometer.	Thermometer.	Barometer.	Thermometer.	Maximum Thermometer.	Minimum Thermometer.	Daily Range.	Daily Mean.	Rainfall.
1	29.94	68.0°	29.95	73.5	29.96	64.5°	74.0°	47.0°	27.0°	60.50°	....
2	30.25	59.0	30.30	59.0	30.28	56.0	63.0	46.0	17.0	54.50	....
3	30.34	63.0	30.35	66.5	30.29	62.5	67.0	50.5	16.5	58.75	....
4	30.25	66.5	30.23	65.5	30.15	62.5	67.5	58.0	9.5	62.75	....
5	30.00	59.0	29.96	72.0	29.92	65.0	73.0	59.0	14.0	66.00	0.08
6	29.90	67.0	29.94	71.0	29.97	63.0	72.0	49.0	23.0	59.50	0.01
7	30.20	61.0	30.22	65.0	30.20	62.0	68.0	48.0	20.0	58.00	....
8	30.40	61.0	30.43	62.0	30.40	58.5	65.0	47.0	18.0	56.00	....
9	30.42	62.0	30.40	63.0	30.36	60.0	66.0	48.0	18.0	57.00	....
10	30.38	62.0	30.39	63.5	30.40	58.0	66.0	48.0	18.0	57.00	....
11	30.41	59.0	30.41	63.5	30.38	60.0	67.0	49.0	18.0	58.00	....
12	30.34	62.0	30.28	64.5	30.24	61.0	65.0	49.0	16.0	57.00	....
13	30.20	61.0	30.15	68.0	30.10	63.0	70.0	61.0	9.0	65.50	0.01
14	29.92	66.0	29.84	68.0	29.78	67.0	70.5	58.5	12.0	64.50	0.99
15	29.81	62.0	29.86	68.0	29.88	63.5	69.5	50.0	19.5	59.75	....
16	30.02	62.5	30.02	69.0	30.50	64.0	71.0	49.0	22.0	60.00	....
17	30.26	58.5	30.26	64.0	30.26	60.0	65.0	49.0	16.0	57.00	....
18	30.26	62.5	30.16	73.0	30.09	68.0	75.5	59.0	16.5	67.25	....
19	29.98	69.0	29.89	77.5	29.89	70.5	78.0	48.0	30.0	63.00	0.04
20	30.27	55.0	30.31	58.0	30.30	58.5	78.0	44.5	33.5	61.25	....
21	30.34	58.5	30.32	64.5	30.29	61.0	65.0	44.0	21.0	54.50	....
22	30.32	56.5	30.32	69.5	30.32	63.0	71.0	56.5	14.5	63.75	....
23	30.34	65.0	30.34	75.0	30.32	68.5	76.0	62.5	13.5	69.25	....
24	30.28	69.0	30.22	72.0	30.18	67.0	76.0	62.5	13.5	69.25	....
25	30.08	67.5	30.00	75.5	29.91	64.0	77.0	62.0	15.0	69.50	0.07
26	29.56	65.0	29.50	63.5	29.50	55.0	68.0	46.0	22.0	57.00	0.43
27	29.72	55.0	29.74	61.5	29.75	53.0	63.0	47.0	16.0	55.00	....
28	29.84	63.0	29.87	67.0	29.92	62.5	70.0	44.0	26.0	57.00	....
29	30.24	53.0	30.27	59.0	30.27	53.5	61.0	41.0	20.0	51.00	....
30	30.30	53.0	30.20	68.0	30.14	62.0	69.0	53.0	16.0	61.00	....

Monthly range . . . . 37.0°
Monthly mean . . . . 60.35°
Monthly rainfall 1.63

Meteorological Record for October, 1892.

	8 A. M.		1 P. M.		6 P. M.		24 HOURS ENDING 8 A. M.				
Date.	Barometer.	Thermometer.	Barometer.	Thermometer.	Barometer.	Thermometer.	Maximum Thermometer.	Minimum Thermometer.	Daily Range.	Daily Mean.	Rainfall.
1	29.93	65.0°	29.94	62.0°	30.02	49.0°	67.5°	36.5°	31.0°	52.00°	....
2	30.17	45.0	30.16	51.5	30.13	48.0	53.0	34.0	19.0	43.50	....
3	30.12	44.5	29.99	51.0	29.83	51.0	55.0	45.0	10.0	50.00	0.01
4	29.52	55.0	29.50	61.0	29.54	53.5	67.0	46.0	21.0	56.50	1.01
5	29.50	46.0	29.50	49.0	29.55	46.0	51.0	35.0	16.0	43.50	0.73
6	29.60	45.0	29.70	55.0	29.68	46.5	55.0	42.0	13.0	48.50	....
7	29.80	50.0	29.78	63.0	29.76	55.0	64.0	48.0	16.0	56.00	....
8	29.79	58.0	29.76	67.5	29.72	61.0	68.5	55.0	13.5	61.75	....
9	29.64	55.5	29.64	58.5	29.66	54.5	61.0	38.0	23.0	49.50	0.05
10	29.95	46.0	29.97	54.0	29.97	50.0	57.0	42.0	15.0	49.50	0.02
11	30.02	53.0	30.00	62.5	30.06	55.5	65.0	35.0	30.0	50.00	....
12	30.36	43.0	30.40	51.0	30.40	46.0	52.5	40.0	12.5	46.25	....
13	30.43	49.0	30.39	62.0	30.26	56.5	63.0	48.0	15.0	55.50	....
14	30.12	57.0	30.02	69.5	30.01	62.0	71.0	50.0	21.0	60.50	....
15	30.13	56.0	30.13	56.0	30.08	52.5	60.0	52.0	8.0	56.00	....
16	29.94	55.0	29.88	58.5	29.92	58.0	60.0	53.0	7.0	56.50	0.04
17	30.13	53.0	30.18	53.0	30.18	46.0	55.0	41.0	14.0	48.00	0.44
18	30.20	49.0	30.13	54.0	30.05	51.0	58.0	48.0	10.0	53.00	....
19	29.84	57.0	29.73	64.0	29.73	56.5	65.0	43.0	22.0	54.00	....
20	29.97	48.0	29.96	59.0	29.96	48.5	59.0	42.0	17.0	50.50	....
21	29.97	47.5	29.91	55.5	29.91	48.0	57.0	42.0	15.0	49.50	....
22	29.98	49.0	29.94	58.0	29.90	52.0	59.0	42.0	17.0	55.00	....
23	29.77	46.0	29.66	58.5	29.70	49.0	61.0	37.0	24.0	49.00	....
24	29.79	43.0	29.79	49.0	29.80	42.5	50.0	32.0	18.0	41.00	....
25	29.84	40.0	29.82	50.0	29.80	46.0	51.0	40.0	11.0	45.50	....
26	29.75	44.0	29.72	48.0	29.69	43.5	51.0	33.0	18.0	42.00	0.14
27	29.79	40.0	29.80	52.0	29.82	44.0	53.0	35.0	18.0	44.00	....
28	29.90	42.0	29.87	50.0	29.82	44.0	52.0	33.0	19.0	42.50	....
29	29.70	45.0	29.54	50.5	29.54	44.5	51.5	37.0	14.5	44.25	0.09
30	29.80	43.5	29.92	49.0	30.01	42.0	51.0	32.0	19.0	41.50	....
31	30.18	39.0	30.16	51.0	30.13	47.0	52.0	39.0	13.0	45.50	....

Monthly range . . . . 39.0°
Monthly mean . . . . 49.70°
Monthly rainfall 2.56

Meteorological Record for November, 1892.

	8 A. M.		1 P. M.		6 P. M.		24 HOURS ENDING 8 A. M.				
Date.	Barometer.	Thermometer.	Barometer.	Thermometer.	Barometer.	Thermometer.	Maximum Thermometer.	Minimum Thermometer.	Daily Range.	Daily Mean.	Rainfall.
1	30.07	45.0°	30.07	52.0°	30.16	48.0°	55.0°	39.0°	16.0°	47.00°	0.12
2	30.33	43.0	30.24	47.0	30.11	48.0	50.0	39.0	11.0	44.50	0.08
3	29.95	43.0	29.79	49.0	29.79	43.0	50.0	38.0	12.0	44.00	0.39
4	29.82	42.0	29.74	50.0	29.69	45.5	52.0	37.0	15.0	44.50	0.05
5	29.50	37.0	29.50	33.0	29.69	30.0	38.5	25.0	13.5	31.75	*0.04
6	30.02	29.5	30.10	37.0	30.14	34.0	40.0	29.0	11.0	34.50	....
7	30.20	40.0	30.14	53.5	30.08	50.0	60.0	40.0	20.0	50.00	0.04
8	29.89	60.0	29.91	62.5	30.00	46.0	64.0	35.0	29.0	49.50	....
9	30.28	39.0	30.31	45.0	30.33	40.0	48.0	38.0	10.0	43.00	1.01
10	29.96	42.0	29.69	45.0	29.66	36.0	46.0	28.0	18.0	37.00	0.57
11	29.98	30.0	30.02	36.0	30.03	31.0	38.0	24.0	12.0	31.00	....
12	30.05	32.0	30.05	38.5	30.05	37.0	39.5	31.0	8.5	35.25	....
13	30.24	33.0	30.32	45.0	30.35	38.0	46.0	33.0	13.0	39.50	....
14	30.35	43.0	30.29	50.0	30.27	44.0	51.0	40.0	11.0	45.50	....
15	30.23	48.0	30.21	55.0	30.18	51.0	57.0	48.0	9.0	52.50	1.14
16	29.79	53.0	29.70	55.0	29.72	50.0	57.0	43.0	14.0	50.00	0.28
17	30.06	47.0	30.09	55.0	30.08	49.0	56.0	46.0	10.0	51.00	....
18	30.01	53.0	29.85	54.0	29.70	54.0	57.0	40.0	17.0	48.50	0.26
19	29.78	42.0	29.74	46.0	29.76	40.0	47.0	34.0	13.0	40.50	....
20	29.92	35.0	30.00	43.5	30.11	37.0	44.0	25.0	19.0	34.50	....
21	30.16	31.0	30.06	43.0	29.98	43.0	45.0	31.0	14.0	38.00	....
22	29.91	36.0	29.87	39.0	29.87	31.0	41.0	21.0	20.0	31.00	....
23	29.80	25.0	29.76	31.0	29.75	25.0	37.0	19.0	18.0	28.00	....
24	29.75	23.5	29.75	31.0	29.76	28.0	32.0	21.0	17.0	26.50	....
25	29.88	29.0	29.92	40.0	29.96	32.0	40.0	23.0	13.0	31.50	....
26	30.12	26.0	30.17	38.0	30.20	35.0	39.0	26.0	7.0	32.50	....
27	30.35	34.0	30.37	38.0	30.38	35.0	38.0	31.0	13.0	34.50	....
28	30.32	32.0	30.24	40.0	30.22	35.0	44.0	31.0	12.0	36.00	0.18
29	30.14	32.0	30.06	36.0	30.06	36.0	38.0	26.0	7.0	32.00	*0.39
30	29.88	29.0	29.84	34.0	29.82	33.0	35.0	28.0	45.0	31.50	*0.12

Monthly range	45.0°
Monthly mean	39.18°
Monthly rainfall	4.67

*Snow.

Meteorological Record for December, 1892.

	8 A. M.		1 P. M.		6 P. M.		24 HOURS ENDING 8 A. M.				
Date.	Barometer.	Thermometer.	Barometer.	Thermometer.	Barometer.	Thermometer.	Maximum Thermometer.	Minimum Thermometer.	Daily Range.	Daily Mean.	Rainfall.
1	29.74	34.0°	29.72	36.0°	29.72	34.0°	40.0°	31.0°	9.0°	33.50°	....
2	29.73	34.0	29.72	40.0	29.69	38.0	41.0	24.0	17.0	32.50	....
3	29.66	26.5	29.60	39.0	29.60	31.0	39.5	26.5	13.0	33.00	....
4	29.59	33.5	29.59	39.0	29.71	33.5	42.0	24.0	18.0	33.00	....
5	29.93	28.5	29.98	33.5	30.00	29.0	34.0	17.5	16.5	25.75	....
6	30.10	20.0	30.10	31.0	30.01	32.0	35.0	20.0	15.0	27.50	*0.11
7	29.90	34.0	29.96	40.0	29.99	33.5	41.0	31.0	10.0	36.00	....
8	29.93	41.0	29.80	43.0	29.72	44.0	45.0	35.0	10.0	40.00	0.70
9	29.79	36.0	29.88	44.0	29.97	37.5	45.5	29.5	16.0	37.50	....
10	30.09	33.0	30.07	40.0	30.06	33.5	40.0	26.0	18.0	33.00	0.02
11	30.11	30.0	30.18	39.5	30.27	31.5	40.0	23.0	17.0	31.50	....
12	30.41	27.5	30.42	35.0	30.40	30.0	36.0	26.0	10.0	31.00	....
13	30.40	29.0	30.39	40.0	30.36	34.0	40.0	28.0	12.0	34.00	0.16
14	30.08	35.0	29.96	39.0	29.97	33.0	58.0	31.0	27.0	44.50	0.12
15	30.06	32.0	30.04	38.0	30.00	37.0	40.0	26.0	14.0	33.00	....
16	30.08	27.0	30.07	39.0	30.05	33.0	46.0	27.0	19.0	33.50	....
17	29.99	32.0	29.94	39.0	29.91	36.0	41.0	21.0	20.0	31.00	....
18	29.94	22.0	29.96	31.0	29.95	26.5	35.0	22.0	13.0	28.50	....
19	29.90	35.0	29.83	42.0	29.81	35.0	42.0	32.0	10.0	37.00	....
20	29.73	33.0	29.70	31.0	29.82	21.0	34.0	12.0	22.0	23.00	0.01
21	30.16	16.5	30.14	29.0	30.11	26.0	30.0	15.0	15.0	22.50	....
22	30.10	17.0	30.04	27.0	30.01	20.0	28.0	11.0	17.0	19.50	....
23	29.95	14.0	29.79	23.0	29.74	17.5	23.0	1.0	22.0	12.00	....
24	29.60	2.0	29.60	8.0	29.64	10.0	21.0	2.0	19.0	11.50	....
25	29.67	19.0	29.58	23.5	29.48	19.0	24.5	6.0	18.5	15.25	....
26	29.69	9.0	29.76	11.5	29.85	10.0	13.0	6.0	7.0	9.50	....
27	29.92	12.0	29.94	25.0	29.96	21.0	27.0	11.0	16.0	19.00	....
28	30.02	16.0	30.04	25.0	30.05	21.0	27.0	15.0	12.0	21.00	....
29	30.15	18.5	30.21	32.0	30.22	25.0	32.0	10.0	22.0	21.00	....
30	30.28	18.0	30.33	33.0	30.32	27.0	34.0	17.0	17.0	25.50	....
31	30.24	19.0	30.16	30.0	30.14	26.0	30.0	19.0	11.0	24.50	....

Monthly range	57.0°		
Monthly mean		27.81°	
Monthly rainfall			1.12

*Snow

SUMMARY OF STATISTICS.

Report of 1892.

LYNN WATER WORKS, LYNN, MASS.

Popoulation by census of 1890, Lynn and Saugus,	59,400
Date of construction,	1870 to 1872
Owned by,	City of Lynn.
Source of supply,	Four artificial storage basins, formed by constructing dams across the valleys of four brooks, and the water of one other brook in North Saugus taken direct.
Mode of supply,	By gravitation to the pump well, and pumped thence to a distributing reservoir at an elevation of 177 feet above mean high tide by one Leavitt engine, built by J. P. Morris & Co., of Philadelphia, of 5,000.000 daily capacity, and one Loretz engine of 10,000,000 daily capacity.
1. Kind of coal used,	George's Creek Cumberland.
2. Cost of coal,	$4.50 and $4.45 per net ton (2,000 lbs.) delivered.

	Leavitt.	Loretz.
3. Coal consumed for the year, in pounds,	513,250	1,226,233

	Leavitt.	Loretz.
4. Total pumpage for the year, in gallons,	407,005,464	892,035,634
5. Average dynamic head against which pump works,	161.44	156.27
6. *a*. Number of gallons pumped per pound of coal,	793	727.40
b. Number of gallons raised 100 feet per pound of coal,	1,280.21	1,136.70
7. Duty, in foot pounds per 100 pounds of coal, no deductions, $\text{Duty}=\frac{\text{gallons pumped(4)}\times 8.34\times 100\times\text{dynamic head(5)}}{\text{total coal consumed}}$	106,769,871	94,809,202

COST OF PUMPING, FIGURED ON PUMPING STATION EXPENSES, VIZ., $9,741.96.

8. Per million gallons raised against average dynamic head (5) into reservoir,	$7.49
9. Per million gallons raised one foot high (dynamic),	4.69 cents

COST OF PUMPING, FIGURED ON TOTAL MAINTENANCE, VIZ., $98,019.91.

10. Per milion gallons raised against dynamic head (5) into reservoir,	$75.45
11. Per million gallons raised one foot high (dynamic),	47.28 cent

FINANCIAL.

MAINTENANCE.

RECEIPTS.		EXPENDITURES.	
From consumers:			
A. Water rates, domestic,	$127.305.38	AA. Management and repairs,	$28,126.14
B. Water rates, manufacturing,	39,040.31	BB. Interest on bonds,	69,893.76
C. Net receipts, for water,	$166,345.69	CC. Total maintenance,	$98,019.91
D. Repairs and sundries,	2,003.11	DD. Balance carried to sinking fund,	90,328.89
E. Total from ordinary consumers,	$168,348.80		
F. From public funds, general appropriation,	20,000.00		
G. Gross receipts from all sources,	$188,348.80	EE. Total,	$188,348.80

CONSTRUCTION.

RECEIPTS.		EXPENDITURES.	
F. From balance of 1890,	$8,328.51	FF. Extension of main lines,	$55,135.61
G. Appropriations bonded,	75,000 00	GG. Extension of service pipes,	12,810.08
H. Pipes, meters and labor,	7,647.52	HH. Meters,	2,554.56
		II. Account Loretz engine,	645.65
		JJ. Account ponds,	5,582.00
		LL. Total construction for year,	$76,727.90
		MM. Balance,	14,248.13
I. Total,	$90,976.03	NN. Total,	$90,976.03

J. Net cost of works to date . .	$1,985,599.35
K. Bonded debt, Dec. 31, 1892 . .	1,626,500.00
L. Value of sinking fund . . .	278,745.38
M. Rate of interest	3½, 3¾, 4, 4½, 5, 6

CONSUMPTION.

Estimated population to date (Lynn and Saugus),	67,000
Estimated population supplied,	64,700
Total number of gallons consumed for the year,	1,299,041,098
Number of gallons metered,	209,245,000
Average daily consumption in gallons,	3,549,293
Gallons per day to each consumer,	54.79

DISTRIBUTION.

Kind of pipe used,	Wrought iron cement-lined and cast-iron
Size,	From 2 to 20 inches in diameter
Extended,	4 miles, 2,824 feet
Total now in use,	103 miles, 1,197 feet
Total now in use,	Lynn, Saugus, Swampscott, 115 miles, 4,861 feet
Number of leaks for the year,	132
Hydrants added,	42
Hydrants now in use,	747
Gates added,	44
Gates taken out,	6
Gates now in use,	892
Range of pressure of city for day and night,	50 to 65 pounds

SERVICES.

Kind of pipe used,	iron, cement-lined adamanta and galvanized iron
Size of pipe used,	¾ to 10 inches in diameter
Extended,	29,212 , 6'
Discontinued,	7,350
Number of services added,	648
Number of services discontinued,	175
Number of services now in use,	10,148
Total length of services,	80 miles, 4,745 feet
Number of services added in Saugus,	94
Number of services now in use in Saugus,	440
Length of services added in 1892,	4,751 feet
Total length of services in Saugus,	4 miles, 1,996 feet
Meters added,	81
Meters now in use,	494

1912 222

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ANNUAL REPORT

OF THE

PUBLIC WATER BOARD

OF THE

CITY OF LYNN

FOR THE YEAR ENDING DECEMBER 31, 1893

LYNN, MASS.:
WHITTEN & CASS, PRINTERS,
1894.

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LYNN, MASS.:
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1894.

OFFICERS FOR 1893.

QUINCY A. TOWNS,
For one year.

W. B. LITTLEFIELD, *Pres.,*
For two years.

DAVID KNOX,
For three years.

D. A. SUTHERLAND,
For four years.

JOHN MACNAIR,
For five years.

Superintendent and Clerk, JOHN C. HASKELL.
Water Registrar, WALLACE O. MUDGE.
Pumping Engineer, C. A. COWLES.
Assistant Engineer, G. S. SANBORN.
Foreman of Mains, EDWIN MAXWELL.
Foreman of Services, HENRY WHEELOCK.
Foreman of Meters and Repairs, W. H. McCLAIN.
Inspectors, WINSLOW J. ROWELL, W. B. MOULTON; J. FRANK POOL, JOHN CHAMBERLAIN.

PUBLIC WATER BOARD FOR 1894.

W. B. LITTLEFIELD, *Pres.*, for one year.
DAVID KNOX, for two years.
D. A. SUTHERLAND, for three years.
JOHN MACNAIR, for four years.
THOS. P. NICHOLS, for five years.

ANNUAL REPORT.

OFFICE OF THE PUBLIC WATER BOARD,
January 1, 1894.

To the Honorable Mayor and City Council of the City of Lynn:

The Public Water Board hereby presents to the City Council its twenty-second annual report, together with the reports of the Superintendent and Registrar.

WATER SUPPLY.

In 1892 the total amount of water collected from the watershed of Breed's, Birch and Walden Ponds together with Hawkes Brook was insufficient to equal the consumption. In addition to this supply, we had a right to take the waters of Saugus river when more than 12,000,000 gallons per day were running at Pranker's Mill.

From the probable increase in consumption as shown in the past, it was plainly evident that the additional amount of water that could be gathered from this source would be inadequate to meet our needs, for more than five years, and the Board in its Report of 1892 recommended that the City Council petition the Legislature for the right to take the waters of Saugus river and its tributaries, as an additional water supply for the City of Lynn.

As the result of this petition, by an act passed in the Legislature May 27th, 1893, and contained in chapter 400 of the Acts of 1893, authority was given to the City of Lynn to take Saugus river and its tributaries (except Quannapowitt and Crystal Lakes in Wakefield), as an additional water supply.

This addition comprises an available water-shed of 19 3-4 square miles, 15 1-4 of which is situated above Howlett's Mill, from this latter area, water can run by gravity through a canal already built from Howlett's Mill to the Hawkes Brook Canal at the intersection of Water and Walnut Streets. The remaining 4 1-2 square miles is situated between Pranker's and Howlett's Mills. From this area the water could be taken into the canal near the upper end of the tunnel by pumping.

A settlement has been made with the Pranker heirs for the sum of $77,500.00 by which the city purchases all claims for water damage, with all claims existing in two lawsuits pending in the Superior Court of Essex County, for water previously taken by an act of the Legislature passed June 23, 1883, together with all rights of flowage both in Pranker's Pond and the meadows situated above the railroad at Montrose, containing over one square mile. This area is peculiarly adapted for an underground supply and investigations are now being made in that direction to ascertain the probable amount and quality of water that can be secured in the valley of Saugus river, above Howlett's Mill.

As it has been demonstrated by the thorough examinations made by the State Board of Health of the various water supplies in the State, that the best quality is obtained from the underground system. From the condition of Walden and Glen Lewis Ponds during the summer of 1892, it seemed probable that no reliance would be made on the water of these reservoirs for the summer of 1893, and that our only supply of potable water would come from Breed's and Birch Ponds, making it necessary to fill these ponds to their greatest capacity and retain the water as late into the summer as possible.

The water-shed of Birch Pond being insufficient to fill the pond in any year, it was deemed advisable to fill the pond by pumping from the canal. To secure the water from Hawkes Brook without intermixture with the Walden Pond water, a flume was constructed in the site of an old dam across the valley of Hawkes Brook, forming a small reservoir, in which the water was stored, until a sufficient quantity was collected to furnish both the regular supply for the daily consumption of the City; and also to the full capacity of the pump at Birch Pond. By the most careful management, working night and day to keep the canal free from ice and snow, Birch Pond was filled to within four inches of its greatest capacity and 196,000,000 gallons were pumped into the pond.

The importance of securing this additional water is shown from the fact that on Nov. 27th, 1893, but 14,067,000 gallons of water, equal to four days' consumption, remained in Breed's and Birch Ponds. Only for the additional water secured in Birch Pond by pumping, we would have been obliged to use Walden Pond water after Oct. 10th, at which time the water was totally unfit for use.

During the summer of 1892, the waters of Walden and Glen Lewis Ponds were filled with a large growth of algae, no perceptible improvement could be seen in this respect over previous years. To find relief if possible from this trouble without removing the organic matter that covers the bottom of the ponds, the water of Glen Lewis Pond was let into Walden Pond, leaving the bed of Glen Lewis Pond exposed to the weather through the winter of 1892 and 1893, to see if the alternate freezing and thawing to which it would be exposed might not to some extent destroy the food on which algae is dependent for its existence. In the summer of 1893, the water of Walden Pond improved in a very slight degree. In Glen Lewis Pond a great improvement was shown. The marked improvement shown in Glen Lewis Pond over Walden Pond, leads to the conclusion that the quality of the water would be greatly improved by exposing the beds of Glen Lewis and Walden Ponds through several winters.

No opportunity has been afforded to bare the bed of Walden Pond in the winter as since its construction we have been obliged to depend upon its water for our daily consumption through the winter.

With the additional supply now secured from Saugus River, we can draw down the water in Walden Pond and test the value of this experiment to hasten the time when the Walden Pond reservoir can be used in the summer.

To add to our summer supply for a short time in the immediate future, we can depend upon the water of Pillings' Pond, a reservoir situated on one of the tributaries of Saugus River, in Lynnfield, which contains water of excellent character.

On May 1st, 1892, a communication was received in the Board from Mr. Charles A. Coffin of Lynn, offering to defray the expense of planting trees and shrubs around Walden and Glen Lewis Ponds and their approaches. It was voted to accept the offer of Mr. Coffin, and that the Board tender its thanks in behalf of the citizens of Lynn for his generous gift. The work of setting out the trees and shrubs was immediately commenced and the entire roadway from Lynnfield Street in Lynn, to Walnut Street in Saugus was lined with beds of shrubs and trees which in time will add to the beauty of the ponds and furnish a most acceptable shade in the summer months.

HIGH SERVICE.

During the past year the merits of various systems designed to furnish a better supply in the Highlands have been examined, and the Board recommend that when the Highland service is improved, it should be by means of a hydraulic engine, taking the water from the distribution pipe between the Reservoir and the Pumping Station and pumping into a stand-pipe to be constructed on the hill above the present Reservoir, first cost $40,000, expense of maintenance, interest on cost of plant.

STREET MAINS.

The cement-lined pipes in various streets aggregating a total length of over two miles, were taken out and replaced with cast-iron mains. During the year one hundred and ninteen bursts occured, showing a decrease over the previous year of thirteen. Nealy all occured in the night. By prompt repairs no business interests suffered from being deprived of water.

It is the intention of the Board each year to replace a portion of the cement-lined pipe with cast-iron, taking all streets where the expense of maintenance approaches the interest on the cost of relaying with cast-iron pipe, and whenever it is the intention of the City Council to pave a street, mains were laid in all streets petitioned for, when the abuttors were willing to pay five per cent. on the cost of laying the pipe until the water rates in the street equal the five per cent. per year.

I wish to say a few words in relation to the great importance of a regular biological examination of the waters of the several ponds that comprise the water supply of Lynn.

Mr. G. C. Whipple who has charge of the Boston Laboratory work, has made biological examinations for the City of Lynn each week since June, 1893. Those examinations were made in Boston until August, 1893. Since then they have been made in our own laboratory which is located in the basement of the City Hall. Mr. Whipple has instructed Miss McFarlane in making biological examinations and considers her fully capable to take charge of the laboratory work. The frequent examinations made the past year, have been of great assistance to the water department. We have known the different kinds of organisms and how many were present at all times in the several ponds.

A complete record is kept of each examination which is carefully studied by the Superintendent. By these examinations he has been enabled to give the consumer, water of better quality to any given in former years. The Superintendent has taken great interest in this department, and I refer you to his laboratory report.

By an order passed in the City Council June, 1892, authority was given the Public Water Board to purchase land on the water shed of Walden and Glen Lewis Ponds.

The following pieces of property have been purchased under the act:

C. F. Richardson, 2¾ acres	$20.00	$55 00
M. A. Ramsdell, 10⅞ acres	20.00	217 50
P. A. Chase, 4½ acres	20.00	90 00
P. A. Chase, 12¾ acres		318 75
P. A. Chase, 4 acres		100 00
B. Percival, heirs, 3½ acres		75 00
H. M. Stacy, 7⅛ acres	20.00	142 50
S. N. Breed & Co., 7⅜ acres		184 37
John Chapman, one-half of 3¾ acres		130 00
F. A. Ireson, one-half of wood lot		70 00
Johnson, heirs,		270 00
		$1,653 12

WATER DEBT STATEMENT FOR THE YEAR ENDING DECEMBER 20, 1893.

RECEIPTS AND EXPENDITURES.

Water debt December 20, 1892	$1,626,500 00	
Amount borrowed during year ending December 20, 1893	140,000 00	$1,766,500 00
Amount of debt paid during year ending December 20, 1893		41,200 00
Amount of debt outstanding		$1,725,300 00

Receipts from water rates during the year	$177,356 77	
Receipts from premiums, and accrued interest on loans	422 45	$177,779 22
Expenditures charged to water maintenance		112,140 64
Net receipts carried to sinking funds		$65,638 58

CONDITION OF SINKING FUNDS.

Amount of sinking funds December 20, 1892, as per report of commissioners	$202,302 42	
Amount paid to commissioners by city treasurer during year 1893	76,442 96	
Income from investments reported by commissioners	9,689 35	
Total amount of sinking funds		$288,434 73
Deduct amount paid on account of matured bonds		41,200 00
Amount in hands of commissioners December 20, 1893		$247,234 73
Add net receipts from water maintenance for year ending December 20, 1893, not yet paid to commissioners		65,638 58
Total amount of sinking funds December 20, 1893, in hands of commissioners and in city treasury		$312,973 31

Respectfully submitted,

W. B. LITTLEFIELD,

President.

Report of the Water Registrar.

OFFICE OF THE PUBLIC WATER BOARD,
LYNN, January 1, 1894.

To W. B. Littlefield, Esq., President Public Water Board:

SIR,—I herewith present the financial condition of the Department for the year ending December 31, 1893.

RECEIPTS.

Fixture rates		$130,580 67
Meter rates		40,616 97
Additional rates		3,739 94
Miscellaneous rates		2,044 88
Fines		146 00
Total revenue		$177,129 06
Extra pipe and labor	$8,626 39	
Sale of wood	115 75	
		8,742 14
Total receipts as per cash book		$185,871 20

COMPARATIVE STATEMENT OF REVENUE.

Revenue collected during the year		$177,129 06
Amount outstanding fixture rates	$5,148 58	
Amount outstanding meter rates	1,076 39	
Amount outstanding meter rates, not due	8,384 96	
		14,609 93
		$191,738 99
Deduct amount due January 1, 1893		13,935 43
Revenue for year 1893		$177,803 56
Revenue for year 1892		188,979 88
*Decrease		$11,176 32

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*The cause of this decrease is by reason of the City Council cutting off the annual appropriation of $20,000. Substituting the said $20,000 for sake of comparison, the increase would be $8,823,68.

STATEMENT OF NET EARNINGS FOR 1893.

Revenue		$177,803 56

EXPENSES.

Interest	$70,785 50	
Maintenance	38,707 17	
Rebate to Saugus	3,243 00	
		112,735 67
Net earnings		$65,067 89

EXPENDITURES.

MAINTENANCE.

Pumping expenses	$9,843 95	
Salaries and office expenses	8,044 52	
Repairs on mains	6,510 80	
Repairs on services	5,728 10	
Stable and workshop	2,077 80	
New supply	1,598 24	
Engines and boilers	1,559 05	
Damages	785 76	
Laboratory	778 35	
Walden Pond	759 80	
Meters	627 58	
Engine house	171 72	
Reservoir	119 50	
Birch Pond	88 00	
Breed's Pond	14 00	
		$38,707 17

CONSTRUCTION EXPENSES.

New supply	$78,454 17	
Mains, hydrants and gates	23,134 89	
Services and courts	11,796 27	
Meters	4,364 69	
Walden Pond	1,743 12	
		119,493 14
Amount received for pipe, etc.	$8,626 39	
Amount received for wood	115 75	
		8,742 14
Net		$110,751 00

STATEMENT

SHOWING COST OF WORKS TO JANUARY 1, 1894.

Mains, hydrants and gates		$814,719 06
New supply and land		314,790 75
Services and courts		260,879 31
New basin and land		181,183 62
Engines and boilers		140,327 29
Reservoir and land		131,581 49
Birch Pond and land		93,471 84
Engine house and land		57,562 39
Breed's Pond and land		56,435 28
Pipe conduits and land		45,293 98
Force mains and land		41,546 13
Meters		34,695 55
Highland service		12,431 17
Tubular wells		9,374 02
Engineering		8,564 99
Hawkes' Pond		2,306 52
Work shop and stable		2,056 97
Total cost		$2,207,220 36
Less amount received for pipe	$104,602 33	
Less amount received for wood	4,267 68	
Less amount received for Deane pump	2,000 00	
		110,870 01
Total net cost		$2,096,350 35

Following will be found the usual tables, exhibiting the number of buildings, families, stores, factories, etc., supplied with water, the class of premises to which meters are attached, the number and kind of fixtures, the yearly revenues of the department, etc.

Respectfully submitted,

WALLACE O. MUDGE,
Water Registrar.

SERVICES.

Whole number of services		11,095
Put in during the year	562	
Discontinued	47	
Not in use	96	
Turned on (new services)	544	
Turned on (re-occupied)	182	
Turned on (change of ownership)	38	
Turned on (rates and fines paid)	9	
Shut off (for vacancy)	296	
Shut off (for non-payment)	18	
Services put in at Saugus, 1893	86	
Whole number at Saugus	526	

The ratio of yearly increase in the number of services from 1876 is as follows:

1876	6.54 per cent.	1885	6.36 per cent.
1877	7.60 " "	1886	6.58 " "
1878	6.14 " "	1887	5.84 " "
1879	6.04 " "	1888	6.67 " "
1880	8.75 " "	1889	6.67 " "
1881	10.25 " "	1890	7.40 " "
1882	9.92 " "	1891	6.90 " "
1883	10.80 " "	1892	6.00 " "
1884	8.62 " "	1893	5.32 " "

STATEMENT

SHOWING THE NUMBER OF BUILDINGS TO WHICH WATER IS SUPPLIED, ALSO THE NUMBER OF FAMILES, VARIOUS FIXTURES, ETC., CONTAINED IN THE SAME, TOGETHER WITH THE NUMBER OF FIRE HYDRANTS, DEC. 31, 1892.

	LYNN.	SAUGUS.	TOTAL.
Dwellings	9,896	497	10,393
Stores and shops	1,000	20	10,020
Factories	213		213
Offices	475	10	485
Restaurants and saloons	86		86
School-houses	44	3	47
Churches	27	4	31
Bakeries	32		32
Laundries	16		16
Engine-houses	9	3	12
Families	15,010	586	15,596
Boarding-houses	230		230
Faucets	27,156	930	28,086
Water-closets	9,496	201	9,697
Bath tubs	3,984	137	4,121
Hand hose	2,764	158	2,922
Urinals	248	2	250
Heaters	675	22	697
Stationary engines	166	2	168
Motors	25		25
Greenhouses	28	4	32
Drinking fountains	24		24
Standpipes, fire	15	1	16
Standpipes for water carts	42		42
Sewer connections	16		16
Automatic sprinklers	70	2	72
Hydrants	775	120	895

STATEMENT

SHOWING THE YEARLY REVENUE OF THE DEPARTMENT SINCE THE FIRST INTRODUCTION OF WATER INTO THE CITY IN 1871.

From October 1, 1871, to January 1, 1872	$8.989 00
From January 1, 1872, to January 1, 1873	27,568 16
From January 1, 1873, to January 1, 1874	47,992 61
From January 1, 1874, to January 1, 1875	53,545 61
From January 1, 1875, to January 1, 1876	52,553 26
From January 1, 1876, to January 1, 1877	60,867 12
From January 1, 1877, to January 1, 1878	64,002 50
From January 1, 1878, to January 1, 1879	67,570 14
From January 1, 1879, to January 1, 1880	73,949 80
From January 1, 1880, to January 1, 1881	79,635 12
From January 1, 1881, to January 1, 1882	80,967 76
From January 1, 1882, to January 1, 1883	94,419 52
From January 1, 1883, to January 1, 1884	98,893 54
From January 1, 1884, to January 1, 1885	114,903 86
From January 1, 1885, to January 1, 1886	110,089 11
From January 1, 1886, to January 1, 1887	116,375 70
From January 1, 1887, to January 1, 1888	123,507 73
From January 1, 1888, to January 1, 1889	134,480 27
From January 1, 1889, to January 1, 1890	141,865 53
From January 1, 1890, to January 1, 1891	154,788 27
From January 1, 1891, to January 1, 1892	171,744 85
From January 1, 1892, to January 1, 1893	188,979 88
From January 1, 1893, to January 1, 1894	177,803 56
	$2,245,492 90

FUNDED WATER LOAN.

When Payable.	Rate Per. Cent.	Amount
May 1, 1894	3¾	$10,000
July 1, 1894	6	100,000
Jan. 1, 1896	6	50,000
Mar. 25, 1896	4	100,000
Jan. 1, 1899	5	50,000
Jan. 1, 1900	5	50,000
Apr. 1, 1900	4	10,000
Jan. 1, 1901	5	50,000
Mar. 1, 1903	4	8,000
May 1, 1904	3¾	7,300
Jan. 1, 1905	5	200,000
Apr. 1, 1905	4	150,000
May 1, 1905	3½	71,500
Dec. 1, 1905	3½	5,000
Nov. 1, 1913	4	20,000
Nov. 1, 1913	3¾	31,000
Mar. 15, 1914	4	50,000
Dec. 1. 1914	4	20,000
Dec. 1, 1915	3½	6,000
Apr. 1, 1916	3½	2,000
May 1, 1916	3½	24,500
Sept. 1, 1916	4	10,000
Oct. 1, 1916	4	9,000
Feb. 1, 1917	3½	6,500
June 1, 1917	3½	3,500
July 1, 1917	4	7,500
Aug. 1, 1917	4	5,000
Oct. 1, 1917	4	2,000
Nov. 1, 1917	4	6,500
Apr. 1, 1918	4	15,000
June 1, 1918	4	10,000
July 1, 1918	4	50,000
Apr. 1, 1919	4	100,000
July 1, 1919	4	110,000
Jan. 1, 1920	4	35,000
Apr. 1, 1920	4	150,000
Apr. 1, 1921	4	50,000
Oct. 1, 1921	4	25,000
Jan. 1, 1922	4	50,000
July 1, 1922	4	25,000
Apr. 1, 1923	4	40,000
		$1,725,300

Report of the Superintendent.

To William B. Littlefield, President Public Water Board:

SIR,—In compliance with the city ordinance, I herewith present the annual report of the Superintendent for the year ending December 31, 1893.

On January 1, 1893, Breed's Pond contained 49,172,745 gallons of water, Birch Pond 19,490,226 gallons, Walden Pond 313,943,830 gallons, Glen Lewis Pond 33,626,398 gallons, making a total of 416,233,199 gallons, equal to 117 days' supply figured on the daily average consumption for 1892. On the 11th of March, 1893, Birch Pond contained 76,313,567 gallons of water, a gain of 56,823,341 gallons from January 1. This water was collected from its own water-shed and all water that could run in by gravity from Hawkes Brook. At this date, the work of filling Birch Pond by pumping from the canal was commenced and continued until May 5, at which time the pond was filled to a height of 11 inches above the overflow. This additional height was secured by means of a dam built in the overflow and for the purpose of securing the maximum supply possible for the summer months in Birch Pond.

To fill Birch Pond with Hawkes Brook water from the same canal that is used to convey the Walden Pond water for daily consumption, it became necessary to construct a reservoir in the Hawkes Brook valley to hold back the water of the brook until the pump at the pumping station was not at work or a sufficient amount was gathered in the reservoir to supply both the daily consumption by the city and for the pump at Birch Pond.

Owing to the unusual severity of the winter and the very exposed location of the upper end of the canal, great difficulty was experienced in keeping the canal free from the drifting snow and to clear out the anchor ice, requiring the labor of a gang of men night and day for this purpose.

Breed's Pond filled from its own water-shed, and on June 1, 1893, we had 616,740,616 gallons in the two reservoirs for the summer supply. No water was taken from Birch Pond after November 11, 1892, or from Breed's Pond after December 14.

The first water taken from Breed's Pond in 1893 was on April 10, from Birch Pond June 13. On June 26 the use of the water from the canal was discontinued and our entire supply was drawn from Breed's and Birch Ponds until October 1, when the water from Hawkes' Brook was turned into Birch Pond and contributed to the Birch Pond supply until November 27, at which date the amount of water in Breed's and Birch Ponds was reduced to 14,067,000 gallons. From that time we have been using for daily consumption the flow from Hawkes Brook, supplemented by the requisite amount necessary from Walden Pond to supply the pump.

Since June 1, 1893, weekly microscopical examinations of the water from our various sources of supply have been made. The work has been conducted principally by George C. Whipple, the biologist engaged in making biological examinations of water for the City of Boston. Miss M. W. McFarlane has assisted in the work with a view of assuming its charge as soon as the necessary knowledge has been acquired.

A laboratory was fitted up for the work in the basement of the City Hall. Eighty-three different species of organisms have been found in the waters of the several sources, forty-one of which were common to all. By watching the weekly growth of the different organisms, much valuable information in relation to our water supply can be gained. The time of the greatest growth of the organisms in each pond varied to such an extent that we were not obliged to use the water of any source when the quality was poorest. The greatest and least growth of organisms found in the various examinations by the monthly averages are shown in the following statement, which represents the number of organisms in one cubic centimeter, or twenty drops of water:

Walden Pond in June, 7572; in December, 837.
Glen Lewis Pond in June, 7706; in December, 474.
Breed's Pond in May, 506; in December, 333.
Birch Pond in September, 322; in December, 106.
Saugus River in August, 177; in December, 109.
Tap at the City Hall.

The growth to maturity and subsequent decay of some of these organisms is very rapid. No organism liable to come from sewerage or any injurious to health was discovered. The presence of these organisms, although not dangerous to human life, at times causes a disagreeable taste and odor, and the purpose of the examinations is to give a full knowledge of the condition of each specie of organism in each source of supply, the probable growth to be anticipated, the nature of each, whether injurious or harmless, and to gather all information possible as to the quality of the water before it is taken into the reservoir for use.

From our supply, as at present constructed, water can be drawn from five sources separately, or by twelve different combinations, from two or more sources.

It has been observed that the water containing some species of organisms improves in quality in its passage from the ponds to the city, while water containing other kinds deteriorates. It having been our experience in former years, that water with but slight taste or odor perceptible in the ponds, becomes very disagreeable when delivered for consumption.

From this brief explanation the advantage of acquiring full information about the water in each source of supply can be seen. The amount of water taken from each source is given in Table II. The quality of water used is shown by the analysis made by the State Board of Health each month.

CANAL.

To save all the water running in Hawkes Brook in the spring, it became necessary to fill the canal to the top of the banks. This unusual strain on the sides of the canal made it necessary to drive one hundred and fifty-five feet of spiling at weak points. The line of canal from Howlett's Mill to the Hawkes Brook

Canal, which has been unused since its construction, has been cleaned out; ninety-two feet of spiling were driven at one point.

The brick conduit near Howlett's Mill was cleaned of all debris not removed at the time of its construction. Water was let in several times to the entire canal and drawn off to clean the banks before we commenced to use the water from Hawkes Brook. Three bridges across the canal were repaired by entire new planking. The canal at present is in good condition.

RESERVOIR.

The slope walls of the reservoir are in good condition. No repairs were needed.

PUMPING STATION.

The building is in good condition. The Loretz engine and foundation, also the walls of the basement, were painted. New packing rings were put in all the pistons of the Loretz engine. New rocking grate bars were set in furnace boiler No. 2. A Lamprey furnace mouth protector was set in furnace boiler No. 1, the brick walls of boiler No. 1 were partly relaid, the steps in front of the building were reset, the fence around the lot was straightened and portions reset. At Birch Pond a feed pump and feed water-heater were set and furnaces repaired.

STREET MAINS.

During the year two miles and two hundred and fifty-four feet of cement-lined pipes were taken up and replaced with cast-iron mains in the following streets: Alley from Blossom beyond Shepard to connect with the cast-iron main, Ashland, Cambridge, Essex from Market to High Rock avenue, Federal, Harwood, Whiting, Liberty from Market to Central avenue, Lloyd, Myrtle to the third hydrant from Holyoke, Washington from Amity to connect with the cast-iron main below Tudor, Whiting, Whittier, and Henry avenue from Johnson to Washington. A total of one hundred and nineteen bursts in the cement-lined mains came in the year, being thirteen less than in 1892. Twenty-six thousand, three hundred and forty-one feet of cast-iron pipe from 4" to 12" in diameter has been laid in fifty streets. Of this amount, 10,814 feet replaced cement-lined pipe previously laid. One thousand one hundred and seventy-six feet of 2" pipe has been laid in courts as mains; 22 gates have been set in connection with the new mains; 12 gates were set in place of old ones where pipe was changed to larger sizes in relaying the cement-lined pipes; 14 hydrants were replaced with larger sizes; 28 hydrants added; 12 leaky hydrants repaired; 30 main gate boxes raised where streets were graded; 29 new main gate boxes in place of old. In trenching for mains 1,274 feet of ledge has been excavated; 562 services have been put in, aggregating 26,051 feet in length; 52 services have been extended, of a total length of 2,613 feet; 47 services have been discontinued; 359 services were changed from the old pipe to the new; 708 corporations have been drilled out; 752 new iron stop boxes to replace old wooden ones; 246 leaks in service pipes were repaired; 17 service boxes changed for curbstones; 65 service boxes raised where streets were graded; 31 services lowered; 191 services were thawed out; 82 new stop and wastes were put in to replace old ones; 27 private hydrants were repaired; 187 new meters were set; 111 meters were taken off, tested and repaired; 12 meters taken out; 9 outside meter boxes put in; 10 drinking fountains were repaired.

The following tables show the work performed by the department during the year.

Respectfully submitted,

JOHN C. HASKELL,
Superintendent.

ANALYSIS OF WATER IN GLEN LEWIS POND BY STATE BOARD OF HEALTH.

PARTS IN 100,000.

DATE OF		APPEARANCE.			ODOR.		RESIDUE ON EVAPORATION.			AMMONIA.					NITROGEN.				
							Filtered.				Albuminoid.								
Collection.	Examination.	Turpidity.	Sediment.	Color.	Cold.	Hot.	Total.	Loss on Ignition.	Fixed.	Free.	Total.	In Solution.	In Suspension.	Chlorine.	As Nitrates.	As Nitrites.	Hardness.	Iron.	Oxygen consumed.
Jan. 10	Jan. 11	Distinct.	Very green.	.70	Vegetable.	Often disagreeable.	4.10	2.00	2.10	.0052	.0740	.0360	.0380	.51	.0030	.0002	1.8	. . .	. . .
Feb.	Feb.	. . . .	. . . .	. .			. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. . .	. . .
Mar.	Mar.	. . . .	. . . .	. .			. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. . .	. . .
April 6	April 7	Distinct green.	Slight.	.18			2.10	0.65	1.45	.0032	.0202	.0152	.0050	.34	.0030	.0003	0.6	. . .	. . .
May 8	May 9	Slight.	Slight.	.38			2.25	0.70	1.55	.0046	.0186	.0168	.0018	.32	.0070	.0000	0.2	. . .	. . .
June 6	June 7	Decided.	Considerable.	1.10			4.15	2.35	1.80	.0476	.1966	.0532	.1434	.41	.0090	.0002	0.2	. . .	. . .
July 11	July 12	Slight.	Slight.	.80			3.85	2.35	1.50	.0386	.0538	.0408	.0130	.42	.0070	.0002	0.5	. . .	. . .
Aug. 8	Aug. 9	Decidedly green.	Heavy yellow.	.75			4.50	2.65	1.85	.0002	.0636	.0292	.0344	.42	.0000	.0001	0.5	. . .	. . .
Sept. 6	Sept. 7	Decided.	Heavy yellow.	. .			. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. . .	. . .
Oct. 4	Oct. 5	Decided.	Cons. green.	.40			4.00	2.90	1.10	.0000	.0490	.0326	.0164	.42	.0030	.0000	0.5	.0125	.6006
Nov. 7	Nov. 8	Slight.	Considerable.	.85			4.10	2.60	1.50	.0118	.0398	0.336	.0062	.46	.0030	.0005	0.2	.0230	.7080
Dec. 6	Dec. 8	Distinct green.	Cons. green.	.70			4.45	2.60	1.85	.0010	.1532	.0444	.1088	.44	.0000	.0000	0.3	.0190	.7956

ANALYSIS OF WATER IN BREED'S POND BY STATE BOARD OF HEALTH.

PARTS IN 100,000.

DATE OF		APPEARANCE.			ODOR.		RESIDUE ON EVAPORATION.			AMMONIA.					NITROGEN.				
							Filtered.				Albuminoid.								
Collection.	Examination.	Turpidity.	Sediment.	Color.	Cold.	Hot.	Total.	Loss on ignition.	Fixed.	Free.	Total.	In solution.	In suspension.	Chlorine.	As nitrates.	As nitrites.	Hardness.	Iron.	Oxygen consumed.
Jan. 10	Jan. 11	Very slight.	Very slight.	0.85	Vegetable frequently, also unpleasant or disagreeable.	Generally somewhat stronger.	4.35	1.45	2.90	.0031	.0194	.0150	.0044	.62	.0070	.0001	1.7	. . .	. . .
Feb. 9	Feb. 11	Very slight.	Slight.	0.60			3.65	1.55	2.10	.0134	.0214	.0170	.0044	.53	.0090	.0002	1.5	. . .	. . .
March	March	. . . .	. . . .	. .			. .	. .	. .	. . .	. . .	. . .	. . .	. .	. . .	. . .	. .	. . .	. . .
April 6	April 7	Slight.	Slight.	0.60			3.50	1.10	2.40	.0024	.0176	.0164	.0012	.50	.0090	.0004	0.6	. . .	. . .
May 8	May 9	Very slight.	Very slight.	0.48			3.35	1.15	2.20	.0012	.0150	.0130	.0020	.45	.0000	.0000	0.5	. . .	. . .
June 6	June 7	Very slight.	Considerable.	0.60			3.55	1.55	2.00	.0022	.0174	.0142	.0032	.55	.0030	.0001	0.8	. . .	. . .
July 5	July 6	Very slight.	Slight.	0.45			3.55	1.40	2.15	.0010	.0262	.0228	.0034	.53	.0030	.0001	1.3	. . .	. . .
Aug. 8	Aug. 9	Distinct.	Slight.	0.60			3.10	1.10	2.00	.0006	.0212	.0182	.0030	.54	.0000	.0000	0.9	. . .	. . .
Sept. 6	Sept. 7	Distinct green.	Cons. brown.	0.80			3.55	1.20	2.35	.0012	.0348	.0212	.0136	.46	.0000	.0000	0.8	.0350	.5480
Oct. 4	Oct. 5	Slight.	Slight.	0.58			3.65	2.00	1.65	.0014	.0266	.0220	.0046	.50	.0050	.0001	0.9	.0275	.4697
Nov. 7	Nov. 8	Slight.	Considerable.	1.00			3.95	1.60	2.35	.0030	.0288	.0250	.0038	.62	.0070	.0003	0.6	.0450	.6120
Dec. 6	Dec. 8	Distinct.	Slight.	0.90			3.85	1.60	2.25	.0078	.0270	.0228	.0042	.56	.0100	.0001	0.8	.0400	.5655

TABLE I.

SHOWING THE CONSUMPTION OF WATER FOR THE YEAR ENDING DECEMBER 31, 1893.

MONTH.	Monthly consumption.	Average consumption per day.	Average daily increase.	Average daily decrease.	Average to each inhabitant.	Average to each consumer.
	Gallons.	Gallons.	Gallons.	Gallons.	Galls.	Galls.
January	122,929,967	3,965,483	420,351	.....	56.93	59.31
February	109,430,330	3,908,226	.....	57,257	56.10	58.46
March	116,137,691	3,746,377	.....	161,849	53.78	56.04
April	104,447,903	3,481,597	.....	264,780	49.98	52.07
May	106,253,172	3,427,521	.....	54,076	49.20	51.27
June	122,007,755	4,066,925	639,404	.....	58.38	60.83
July	132,051,772	4,259,735	192,810	.....	61.15	63.72
August	117,450,830	3,788,736	.....	470,999	54.39	56.67
September	109,840,788	3,661,360	.....	127,376	52.56	54.76
October	114,028,434	3,678,337	16,977	.....	52.80	55.02
November	102,346,260	3,411,542	.....	266,795	48.97	51.03
December	109,546,797	3,533,768	122,226	.....	50.73	52.86
Totals and averages	1,366,471,699	3,743,758	.....	.....	53.74	56.00

TABLE II.

AMOUNT OF WATER DRAWN FROM EACH SOURCE DURING THE YEAR 1893.

MONTH.	BREED'S.	BIRCH.	CANAL.	Total.
	Gallons.	Gallons.	Gallons.	Gallons.
January			121,220,190	121,220,190
February			108,366,895	108,366,895
March			118,720,420	118,720,420
April	40,913,835		59,524,685	100,438,520
May	53,856,363		56,152,172	110,008,535
June	31,305,065	58,724,820	31,660,365	121,690,250
July	27,210,233	102,327,967		129,538,200
August	32,630,125	87,461,275		120,091,400
September	39,902,629	70,700,171		110,602,800
October	71,185,400	41,193,900		112,379,300
November	41,474,088	48,032,565	12,526,832	102,033,485
December			107,620,695	107,620,695
Totals	338,477,738	408,440,698	615,792,254	1,362,710,690

TABLE I.

SHOWING THE CONSUMPTION OF WATER FOR THE YEAR ENDING DECEMBER 31, 1893.

MONTH.	Monthly consumption.	Average consumption per day.	Average daily increase.	Average daily decrease.	Average to each inhabitant.	Average to each consumer.
	Gallons.	Gallons.	Gallons.	Gallons.	Galls.	Galls.
January	122,929,967	3,965,483	420,351	. . . . .	56.93	59.31
February	109,430,330	3,908,226	. . . . .	57,257	56.10	58.46
March	116,137,691	3,746,377	. . . . .	161,849	53.78	56.04
April	104,447,903	3,481,597	. . . . .	264,780	49.98	52.07
May	106,253,172	3,427,521	. . . . .	54,076	49.20	51.27
June	122,007,755	4,066,925	639,404	. . . . .	58.38	60.83
July	132,051,772	4,259,735	192,810	. . . . .	61.15	63.72
August	117,450,830	3,788,736	. . . . .	470,999	54.39	56.67
September	109,840,788	3,661,360	. . . . .	127,376	52.56	54.76
October	114,028,434	3,678,337	16,977	. . . . .	52.80	55.02
November	102,346,260	3,411,542	. . . . .	266,795	48.97	51.03
December	109,546,797	3,533,768	122,226	. . . . .	50.73	52.86
Totals and averages	1,366,471,699	3,743,758	. . . . .	. . . . .	53.74	56.00

TABLE II.

AMOUNT OF WATER DRAWN FROM EACH SOURCE DURING THE YEAR 1893.

MONTH.	BREED'S.	BIRCH.	CANAL.	Total.
	Gallons.	Gallons.	Gallons.	Gallons.
January	....	....	121,220,190	121,220,190
February	....	....	108,366,895	108,366,895
March	....	....	118,720,420	118,720,420
April	40,913,835	....	59,524,685	100,438,520
May	53,856,363	....	56,152,172	110,008,535
June	31,305,065	58,724,820	31,660,365	121,690,250
July	27,210,233	102,327,967	....	129,538,200
August	32,630,125	87,461,275	....	120,091,400
September	39,902,629	70,700,171	....	110,602,800
October	71,185,400	41,193,900	....	112,379,300
November	41,474,088	48,032,565	12,526,832	102,033,485
December	....	....	107,620,695	107,620,695
Totals	338,477,738	408,440,698	615,792,254	1,362,710,690

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TABLE III.

SHOWING THE RAINFALL AT THE PUMPING STATION FOR 1893.

Day of Month.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1	0.82	0.16	. . .	. . .	0.24	. . .	. . .	. . .	0.30	. . .	. . .	0.36
2	. . .	0.07	. . .	. . .	0.27	. . .	. . .	. . .	. . .	. . .	. . .	*0.31
3	. . .	0.17	*0.05	. . .	2.33	0.08	. . .	. . .	. . .	0.04	. . .	1.58
4	. . .	. . .	*0.02	. . .	0.17	. . .	. . .	0.72	. . .	. . .	0.63	. . .
5	*0.36	. . .	. . .	*0.30	. . .	. . .	0.16	1.08	. . .	. . .	. . .	*1.00
6	*0.14	0.38	. . .	. . .	0.05	0.37	. . .	3.13	. . .	0.01	. . .	. . .
7	. . .	. . .	. . .	*0.50	. . .	. . .	. . .	0.90	0.46	. . .	. . .	. . .
8	. . .	. . .	0.15	0.35	. . .	. . .	0.01	. . .	. . .	. . .	. . .	. . .
9	*0.30	0.47	0.82	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	*0.35
10	. . .	0.26	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .
11	. . .	. . .	0.03	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	*0.05
12	*0.02	. . .	0.13	. . .	0.01	0.08	0.02	0.33	. . .	. . .	. . .	. . .
13	. . .	*1.62	. . .	. . .	0.47	0.03	. . .	. . .	. . .	0.30	0.01	. . .
14	*0.05	. . .	0.81	0.40	. . .	. . .	. . .	. . .	0.01	0.45	0.11	*0.24
15	*0.03	. . .	. . .	0.39	. . .	. . .	. . .	. . .	. . .	. . .	0.08	*0.30
16	. . .	. . .	. . .	. . .	1.50	0.06	. . .	. . .	0.41	. . .	. . .	0.85
17	. . .	*0.60	. . .	. . .	0.05	0.18	. . .	0.30	. . .	. . .	. . .	. . .
18	. . .	*0.12	. . .	. . .	. . .	. . .	0.06	0.20	. . .	. . .	. . .	*0.08
19	. . .	*0.09	. . .	. . .	. . .	. . .	0.06	. . .	0.09	. . .	. . .	*0.01
20	. . .	*0.02	. . .	1.00	. . .	. . .	. . .	0.65	. . .	. . .	. . .	. . .
21	. . .	*0.51	0.01	0.12	. . .	. . .	. . .	0.91	. . .	. . .	0.55	. . .
22	. . .	*1.04	. . .	0.03	. . .	1.08	1.30	. . .	0.02	. . .	0.09	0.03
23	*0.02	*0.29	*0.14	. . .	. . .	1.17	. . .	0.02	0.03	2.09	. . .	. . .
24	. . .	. . .	. . .	. . .	. . .	. . .	. . .	0.21	. . .	0.05	. . .	. . .
25	*0.05	*0.25	. . .	0.10	. . .	. . .	0.21	. . .	. . .	. . .	. . .	. . .
26	. . .	. . .	. . .	. . .	0.01	. . .	. . .	. . .	0.06	. . .	. . .	. . .
27	. . .	. . .	. . .	0.16	0.54	. . .	. . .	. . .	. . .	0.27	0.30	. . .
28	. . .	*0.35	*0.01	. . .	. . .	. . .	. . .	0.02	. . .	. . .	0.02	0.01
29	0.35	. . .	. . .	. . .	. . .	. . .	. . .	0.21	0.05	. . .	. . .	0.09
30	*0.01	. . .	. . .	0.06	. . .	. .	. . .	. . .	. . .	. . .	. . .	*0.17
31	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	*0.08
	2.15	6.40	2.17	3.41	5.64	3.05	1.82	8.68	1.43	3.21	1.79	5.51

Rainfall for the year 45.26.
***Snow.**

TABLE IV.

SHOWING THE DEPTH OF WATER IN THE PONDS FOR EACH WEEK DURING 1893.

DATE.	Breed's Pond.	Birch Pond.	Walden Pond.	Glen Lewis Pond.
	Feet.	Feet.	Feet.	Feet.
Jan. 1	11.5	7.2	14.10	8.10
Jan. 7	11.11	7.6	14.6½	8.6½
Jan. 14	12.0½	7.6½	14.0½	8.½
Jan. 21	12.2½	7.8½	13.5	7.5
Jan. 28	12.3	7.8½	12.11½	6.11½
Feb. 4	12.6	7.10	12.5	6.5
Feb. 11	13.0	8.4	12.7	6.7
Feb. 18	14.1	9.1½	12.11	6.11
Feb. 25	14.9½	9.5½	12.10	6.10
Mar. 4	15.1	9.8	12.6	6.6
Mar. 11	15.7	10.1	12.5	6.5
Mar. 18	17.7½	12.3	14.0	8.0
Mar. 25	18.9	14.0½	14.2	8.2
Apr. 1	19.9	16.1	14.6	10.0
Apr. 8	20.5	17.4	14.6½	11.1
Apr. 15	20.4	19.3	14.6½	11.8
Apr. 22	21.0	20.5½	14.9¾	12.7
Apr. 29	20.7	21.5½	15.1	13.2
May 6	22.5½	22.5½	15.11½	14.9
May 13	21.7	22.7	16.4	15.6
May 20	21.6	22.10½	16.11	16.7
May 27	21.4½	22.9½	17.0½	17.0
June 3	21.3	22.7½	16.11	17.4
June 10	20.6	22.6	16.8	17.4
June 17	20.3½	21.7	16.8	17.4
June 21	20.2	21.2	16.7½	17.4
June 26	20.3	20.10	16.9	17.4
July 1	19.11	20.2	16.8½	17.4
July 8	19 5½	19.2	16.7	17.3
July 15	18.10	18.3½	16.4½	17.3
July 22	18.4½	17.2	16.2½	17.0½
July 29	18.0½	16.2½	16.1½	17.0
Aug. 5	17.4	15.4	16.1	17.1
Aug. 12	17.6	15.0	16.2	17.3
Aug. 19	17.3	14.1	16.1	17.1½
Aug. 26	17.2	13.3	16.1½	17.2½
Sept. 4	16.9	12.½	16.0	17.2
Sept. 11	16.6	11.4½	15.11½	17.1
Sept. 18	16.1½	10.5	15.10	17.1
Sept. 25	15.9	9.7	15.9	17.0
Oct. 2	14.10	9.1	15.7	17.0
Oct. 9	14.0	8.7½	15.6½	17.0
Oct. 16	13.2	8.1	15.6	17.0
Oct. 23	12.3	7.6½	15.4	16.11
Nov. 1	11.3	7.1½	15.6	17.1
Nov. 6	10.10	7.0	15.6	17.1
Nov. 13	9.5½	6.9½	15.6	17.1
Nov. 20	8.8	5.7	15.5	17.1
Nov. 27	7.11	5.1	16.7	12.10
Dec. 4	8.5	5.5	16.10	10.10
Dec. 11	9.4	5.8½	16.6	10.6
Dec. 18	10.0	6.3	16.5½	10.5½
Dec 25	10.6	6.8	16.3	10.3
1894				
Jan. 1	11.4	7.3	16.4	10.4

TABLE V.

SHOWING THE LOCATION OF GATES SET IN 1893.

STREET.	LOCATION.
Atkins avenue	On E. line Verona street, 17 feet S. of W. line Atkins avenue.
Cambridge	On S. line Liberty street, 15 feet N. of E line Cambridge street.
Celia place	On N. line Lewis street, 8 feet N. of E. line Celia avenue.
Clayton	On E. line Euclid avenue, 12 feet S. of N line Clayton street.
Columbus avenue	On W. line Cedar Hill avenue, 17 feet S. of N. line Columbus avenue.
Essex	On W. line Washington street, 17 feet N. of S. line Essex street.
Federal	On N. line Western avenue, 17 feet W. of E. line Federal street.
Federal	On S. line Marion street, 17 feet W. of E. line Federal street.
Gertrude	On S. line Lexington street, 17 feet W. of E. line Gertrude street.
Grosvenor Park	On S. line Ocean street, 7½ feet W. of E. line Grosvenor Park.
Joint's place	On E. line Jackson street, 7½ feet S. of N. line Joint's place.
Lakeview avenue	On W. line Euclid avenue, 17 feet S. of N. line Lakeview avenue.
Myrtle	On S. line Holyoke street, 17 feet W. of E. line Myrtle street.
Ocean Terrace	On S. line Ocean street, 10 feet W. of E. line Ocean Terrace.
Parker avenue	On S. line Bloomfield street, 10 feet W. of E. line Parker avenue.
Ramsdell court	On S. line Lake street, 10 feet W. of E. line Ramsdell court.
Shepard	On N. line Harbor street, 17 feet W. of E. line Shepard street.
St. Clair	On E. line Michigan avenue, 7 feet S. of N. line St. Clair street.
Strawberry court	On S. line Strawberry avenue, 6½ feet W. of E. line Strawberry court.
Wellington	On N. line Oakwood avenue, 16 feet E. of W. line Wellington street.
Wilfred	On E. line Myrtle street, 13½ feet S. of N. line Wilfred street.
Violet	On W. line Pinkham street, 16 feet S. of N. line Violet street.

TABLE VI.

SHOWING THE LOCATION OF HYDRANTS SET IN 1893.

STREET.	LOCATION.
Allen avenue . .	453 feet from Rockaway street.
Atkins avenue .	548 feet from Verona street.
Brookvale . . .	Opposite Tacoma street.
Cambridge . . .	262 feet from Liberty street.
Clayton	Near corner Euclid avenue.
Commercial . .	335 feet from Alley street.
Eastern avenue .	200 feet from Glenwood street.
Essex	Essex. corner Stewart street.
Gas House road .	1,187 feet from Harbor street.
Harwood . . .	268 feet from Western avenue.
Harwood . . .	280 feet from North Common street.
Henry avenue . .	267 feet from Johnson street.
Lakeview avenue	Near corner Euclid avenue.
Lakeview avenue	407 feet from Euclid avenue.
Lakeview avenue	Near corner Verona street.
Magnolia avenue	439 feet from Euclid avenue.
Morton Hill ave.	377 feet from Arbor street.
Oneida	292 feet from Erie street.
Park avenue . .	287 feet from Springfield avenue.
Pitkin	990 feet from Norton street.
Rockaway . . .	63 feet from Sutton street.
Reservoir road .	267 feet from Stiles street.
Springfield avenue	408 feet from Park avenue.
Whiting	773 feet from North Common street.
Washington . .	Lower corner Power Station
Western avenue .	At corner Eastern avenue.

TABLE VII.

SHOWING THE LEAKS IN PIPES AND HYDRANTS.

MONTH.	SIZE OF MAINS						
	20 in.	16 in.	12 in.	10 in.	8 in.	6 in.	4 in.
January	...	...	1	...	...	2	5
February	...	...	...	...	1	...	3
March	...	...	...	...	2	...	3
April	...	1	...	...	...	1	2
May	1	...	...	...	2	5	7
June	...	...	...	...	1	3	5
July	...	1	...	1	1	5	3
August	...	...	...	...	2	8	19
September	1	...	...	...	2	1	7
October	...	...	...	2	1	1	4
November	...	...	...	...	...	4	6
December	...	1	...	...	1	1	2
	2	3	1	3	13	31	66

1892, 132. Total, 119.

TABLE VIII.

SHOWING THE KIND, SIZE AND NUMBER OF WATER METERS IN USE IN 1893

KIND.	½	⅝	¾	1	1¼	1½	2	3	4	Tot'l.
Thomson	...	46	70	40	...	11	2	1	1	171
Thomson "Bee"	...	17	69	17	...	...	...	...	...	103
Ball & Fitts	...	39	54	19	...	2	...	...	...	114
Worthington	...	16	30	35	3	2	15	1	...	102
Neptune	...	25	31	13	...	1	3	...	...	73
Union	...	...	12	15	...	6	9	...	14	56
Crown	1	1	11	6	...	2	...	...	...	21
Weir	1	...	3	6	...	3	1	...	...	14
Nash	...	2	3	1	...	...	...	...	...	6
Niagara	...	...	...	4	...	...	...	...	...	4
Empire	...	...	...	...	...	...	2	...	...	2
Hersey	...	...	1	...	...	...	...	...	...	1
Frost	...	...	1	...	...	...	...	...	...	1
Gem	...	...	...	...	...	...	1	...	...	1
Motors	...	...	...	...	...	...	...	...	...	2
Totals	2	146	285	156	3	27	33	2	15	669

Total gallons metered, 213,400,000.

TABLE IX.

SHOWING THE NUMBER, SIZE AND LENGTH OF SERVICES LAID IN 1893.

MONTH.	SIZE AND LENGTH OF PIPE.														TOTAL.	
	6 in.		4 in.		2 in.		1½ in.		1¼ in.		1 in.		¾ in.			
	No.	Feet.	No.	Feet.	No.	Feet.	No.	Feet.	No.	Feet.	No.	Feet.	No.	Feet.	No.	Feet.
January											1	11.6	1	102.6	2	114
February			1	31.6	1	8.3									2	39.9
March													4	84.10	4	84.10
April	3	44.10	1	32.6			1	14	1	39.3	27	1,494.5	26	938.4	59	2,563.4
May	1	28	1	11.8	2	505.3	1	18.2	2	274.7	27	1,642.7	34	1,721.2	68	4,201.5
June					6	204.7			1	59.3	30	1,551.9	24	835.9	61	2,651.4
July	1	18					1	18	2	226.9	38	1,774.9	30	1,192.4	72	3,229.10
August											38	1,831.10	27	1,005.3	65	2,827.1
September							1	51.4			29	1,342.3	15	622.8	45	2,016.3
October	1	34.2									25	948	23	777.7	49	1,759.9
November									1	39.10	16	865.8	21	775.5	38	1,680.11
December	1	48.6			1	13.4					5	502.11	4	147.2	11	711.11
Totals	7	173.6	3	75.8	10	731.5	4	101.6	7	639.8	236	11,955.8	209	8,203.0	476	21,580.5

TABLE X.

SHOWING THE AMOUNT AND SIZE OF CAST-IRON PIPE LAID IN 1893.

WHERE LAID.	12 in.	10 in.	8 in.	6 in.	4 in.
Allen avenue				488	
Alley street				*1,011	
Archer street				258	
Ashland street				*918	
Atkins avenue				793	
Averill street					70
Brooklawn terrace				637	
Cambridge street				*465	
Clayton street				57	356
Columbus avenue					264
Commercial street				508	
Eastern avenue		180	222	11	
Essex street			*1,155		
Federal street	*1152			*28	
Gas House road				1,235	
Glen avenue					224
Grosvenor Park					290
Grand View avenue					216
Harwood street				*1,370	
Henry avenue					*495
Isabella street					100
Lake View avenue				1,025	
Liberty street			*483		
Lloyd street					*333
Lynnfield street				1,891	
Magnolia avenue				552	

TABLE X.—Continued.

WHERE LAID.	12 in.	10 in.	8 in.	6 in.	4 in.
Morton Hill avenue					287
Myrtle street				*695	
Ocean Terrace					517
Oneida street				259	204
Ontario street				156	
Otis street					100
Park avenue				358	
Phillips avenue				427	
Pine Hill avenue				72	
Pitkin street					402
Reservoir road				267	38
Rockaway street				212	
St. Clair street				387	
Springfield avenue				489	
Sylvia street					275
Urban street					86
Violet street					340
Verona street					300
Washington street				*1,302	*8
Whiting street				*1,152	
Whittier street					*247
Wilfred street				599	
Western avenue				375	
Totals	1,152	180	1,860	17,997	5,152

* Relaid.

26,341 feet pipe 4 inches and larger.
1,176 feet pipe 2 inches and smaller.
Total laid, 26,341 feet. Total relaid, 10,814 feet.

TABLE XI.

SHOWING THE AMOUNT AND SIZE OF CEMENT-LINED PIPE LAID IN 1893.

WHERE LAID.	2 in.	1½ in.	1¼ in.
Celia place	44	.....	.....
Gertrude-street court	99	.....	.....
Goodrich street	.....	106	.....
Joint's place	245	.....	.....
Parker avenue	287	.....	.....
Ramsdell court	142	.....	.....
Roanoke street	89	.....	.....
Strawberry court	139	.....	.....
Wellington court	116	.....	.....
Totals	1,161	106	.....

	MILES.	FEET.
Total pipe laid in 1893	5	1,117
Cement pipe taken up and replaced with cast-iron pipe	2	252
Total extension	3	865
Previously laid	103	1,197
Private pipe in Swampscott		1,788
Pipe in Saugus	13	2,240
Total supplied by the works	120	810

TABLE XII.

RECORD OF THE LEAVITT ENGINE FOR THE YEAR ENDING DECEMBER 31, 1893.

DATE.	Number of pumping days.	Total pumping time per month.	Average pumping time per day.	Number of revolutions per month.	Average revolutions per minute.	COAL CONSUMED.						Gallons pumped per month allowing 4 per cent. for loss of action in pump.	Average number of gals. pumped per lb. of coal.	Average number of gallons raised 100 feet high per pound of coal.	Average head against the pump.	Average duty in lbs. of water raised 1 foot high per 100 lbs. of coal, no deduction for ashes.	Average duty in lbs. of water raised 1 foot high per 100 lbs. of coal, the ashes deducted.	Oil.	Waste.
						Raising steam.	Pumping.	Banking.	Total.	Ashes.									
Month.	Days	H. M.	H.M.	Rev.	Rev.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	P. ct.	Gals.	Gals.	Gals.	Feet.	Lbs.	Lbs,	Gals.	Lbs.
January . :	27	597.05	22.07	649,800	18.13	2,200	153,350	1,000	156,550	14,120	8.96	121,220,190	774.3	1,252,50	161.76	104,455,790	114,818,184	32	25
February .	26	535.45	20.36	580,900	18.07	2,100	136,800	800	139,700	13,713	9.76	108,366,895	775.7	1,261.98	162.69	105,251,218	116,707,241	28	20
March . .	27	578.40	21.26	636,400	18.33	1,600	148,400	1,000	151,000	12,906	8.47	118,720,420	786.2	1,272.85	161.90	106,160,113	116,081,634	33	25
April . . .	25	488.50	19.33	538,400	18.35	3,300	124,400	1,800	129,500	14,150	10.82	100,438,520	775.6	1,258.25	162.23	104,936,785	117,809,394	25	20
May . . .	27	539.35	19.59	589,700	18.21	3,000	134,300	1,400	138,700	14,740	10.55	110,008,535	793.1	1,275.78	160.86	106,405,496	119,058,102	33	25
June . . .	. .	. . .	. .	. . . . .	. .	. .	. . . . .	. .	. . . . .	. .	. .	. . . . . .	. .	. . .	. .	. . . . .	. . . . .	. .	30
July	. .	. . .	. .	. . . . .	. .	. .	. . . . .	. .	. . . . .	. .	. .	. . . . . .	. .	. . .	. .	. . . . .	. . . . .	. .	20
August . .	. .	. . .	. .	. . . . .	. .	. .	. . . . .	. .	. . . . .	. .	. .	. . . . . .	. .	. . .	. .	. . . . .	. . . . .	. .	10
September.	. .	. . .	. .	. . . . .	. .	. .	. . . . .	. .	. . . . .	. .	. .	. . . . . .	. .	. . .	. .	. . . . .	. . . . .	. .	15
October . .	. .	. . .	. .	. . . . .	. .	. .	. . . . .	. .	. . . . .	. .	. .	. . . . . .	. .	. . .	. .	. . . . .	. . . . .	. .	10
November.	21	424.10	20.12	462,700	18.18	2,600	104,500	1,200	108,300	10,620	9.73	86,316,685	797.	1,275.43	160.03	106,373,574	117,938,760	30	35
December .	26	522.55	20.67	576,900	18.38	3,000	131,500	1,000	135,500	14,260	10.47	107,620,695	794.2	1,278.90	161.03	106,666,818	119,212,750	30	25
Totals and Averages.	179	3,687	20.36	4,034,800	18.23	17,800	933,250	8,200	959,250	94,509	9.78	752,691,940	784.6	1,267.36	161.53	105,659,538	117,260,153	211	260

TABLE XIII.

RECORD OF THE LORETZ ENGINE FOR THE YEAR ENDING DECEMBER 31, 1893.

DATE.	Number of pumping days.	Total pumping time per month.	Average pumping time per day.	Number of revolutions per month.	Average revolutions per minute.	COAL CONSUMED.						Gallons pumped per month allowing 2 per cent. for loss of action in pump.	Average number of gals. pumped per lb. of coal.	Average number of gallons raised 100 feet high per pound of coal.	Average head against the pump.	Average duty in lbs. of water raised 1 foot high per 100 lbs. of coal, no deduction for ashes.	Average duty in lbs. of water raised 1 foot high per 100 lbs. of coal, the ashes deducted.	Oil.	Waste.
						Raising steam.	Pumping.	Banking.	Total.	Ashes.									
Month.	Days	H. M.	H. M.	Rev.	Rev.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	P.ct.	Gals.	Gals.	Gals.	Feet.	Lbs.	Lbs.	Gals.	Lbs.
January	. .	. . .	. .	. . . . .	. .	. .	. . .	. .	. . .	. .	. .	. . . . . .	. .	. . .	. .	. . . . . .	. . . . . .	. .	45
February	. .	. . .	. .	. . . . .	. .	. .	. . .	. .	. . .	. .	. .	. . . . . .	. .	. . .	. .	. . . . . .	. . . . . .	. .	20
March	. .	. . .	. .	. . . . .	. .	. .	. . .	. .	. . .	. .	. .	. . . . . .	. .	. . .	. .	. . . . . .	. . . . . .	. .	10
April	. .	. . .	. .	. . . . .	. .	. .	. . .	. .	. . .	. .	. .	. . . . . .	. .	. . .	. .	. . . . . .	. . . . . .	. .	5
May	. .	. . .	. .	. . . . .	. .	. .	. . .	. .	. . .	. .	. .	. . . . . .	. .	. . .	. .	. . . . . .	. . . . . .	. .	12
June	26	342.30	13.10	582,250	28.33	10,600	146,500	6,900	164,000	14,850	8.98	121,690,250	712.	1,174.06	158.23	97,918,964	107,668,188	25	25
July	26	342.20	13.10	619,800	30.12	10,600	151,450	7,200	169,250	16,400	9.60	129,538,200	765.3	1,219.96	159.41	101,753,836	112,671,487	20	30
August	27	327.05	12.07	574,600	29.27	11,200	138,100	7,500	156,800	15,930	10.08	120,091,400	765.8	1,219.53	159.25	101,721,168	113,224,101	15	30
September	26	300.55	11.34	529,200	29.31	9,100	132,100	7,500	148,700	15,300	10.19	110,602,800	743.7	1,178.98	158.53	98,340,550	109,619,496	16	30
October	26	297.25	11.26	537,700	30.13	11,800	130,950	7,800	150,550	14,420	9.50	112,379,300	746.4	1,184.98	158.76	98,835,440	109,304,896	15	30
November	4	41.40	10.25	75,200	30.08	1,600	18,500	900	21,000	2,150	10.23	15,716,800	748.4	1,193.54	159.48	99,544,463	110,898,341	2	10
December	. .	. . .	. .	. . . . .	. .	. .	. . .	. .	. . .	. .	. .	. . . . . .	. .	. . .	. .	. . . . . .	. . . . . .	. .	6
Totals and Averages.	135	1,651.55	12.14	2,918,750	29.44	54,900	717,600	37,800	810,300	79,050	9.67	610,018,750	752.6	1,196.26	158.05	99,736,937	110,586,951	93	253

Meteorological Record for January, 1893.

	8 A. M.		1 P. M.		6 P. M.		24 HOURS ENDING 8 A. M.				
Date.	Barometer.	Thermometer.	Barometer.	Thermometer.	Barometer.	Thermometer.	Maximum Thermometer.	Minimum Thermometer.	Daily Range.	Daily Mean.	Rainfall.
1	30.12	27.5°	30.01	31.5°	29.81	38.0°	47.0°	27.0°	20.0°	37.00°	0.75
2	29.20	44.0	29.20	41.0	29.29	36.0	45.0	27.0	18.0	36.00	....
3	29.57	31.0	29.57	32.0	29.61	22.0	33.0	3.0	30.0	18.00	....
4	29.75	5.0	29.75	18.0	29.75	14.5	23.0	5.0	18.0	14.00	....
5	29.67	23.0	29.58	30.0	29.59	25.5	31.0	10.0	21.0	20.50	0.10
6	29.46	11.0	29.40	18.0	29.44	15.0	21.0	8.0	13.0	14.50	0.01
7	29.80	11.0	29.79	24.5	29.82	16.5	25.0	5.0	20.0	15.00	....
8	29.86	6.0	29.76	22.0	29.75	10.0	22.0	2.0	20.0	12.00	....
9	29.72	9.0	29.60	24.0	29.47	27.0	32.0	8.0	24.0	20.00	0.16
10	29.13	18.0	29.15	25.0	29.17	15.0	30.0	5.0	35.0	12.50	....
11	29.51	3.0	29.61	11.0	29.73	6.0	12.0	2.0	14.0	5.00	....
12	29.77	10.0	29.58	15.0	29.55	9.0	20.0	8.0	12.0	14.00	....
13	29.48	13.0	29.50	20.0	29.55	11.0	21.0	6.0	15.0	13.50	....
14	29.91	10.0	29.97	18.0	29.98	12.0	19.0	8.0	11.0	13.50	*0.08
15	29.89	12.0	29.78	21.5	29.74	16.0	23.0	4.0	19.0	13.50	*0.02
16	29.95	6.0	30.03	15.0	30.09	11.0	18.0	0.0	18.0	9.00	....
17	30.23	5.0	30.25	16.0	30.24	10.0	18.0	4.0	14.0	11.00	....
18	30.34	8.0	30.33	15.0	30.30	13.0	18.0	7.0	11.0	12.50	....
19	30.10	14.0	30.00	26.0	29.92	19.0	27.0	8.0	19.0	17.50	....
20	29.82	13.0	29.84	20.0	29.89	14.0	21.0	6.0	15.0	13.50	....
21	29.97	9.0	30.02	23.0	30.05	17.0	24.0	6.0	18.0	15.00	....
22	30.17	10.0	30.19	23.0	30.19	17.0	25.0	8.0	17.0	16.50	....
23	30.17	17.0	30.10	29.0	30.08	27.0	31.0	17.0	14.0	24.00	....
24	30.06	27.5	30.07	35.0	30.09	29.0	36.0	18.0	18.0	27.00	....
25	30.00	31.5	29.83	38.0	29.92	32.0	41.0	21.0	20.0	31.00	....
26	30.14	25.0	30.10	34.0	30.02	32.0	37.0	25.0	12.0	31.00	....
27	30.13	30.0	30.24	32.0	30.32	22.0	35.0	12.0	23.0	23.50	....
28	30.50	18.0	30.51	24.0	30.50	18.0	25.0	17.5	7.5	21.25	0.06
29	30.28	23.0	30.13	33.5	30.00	38.0	40.0	22.0	18.0	31.00	0.25
30	30.20	29.0	30.26	32.0	30.26	30.0	34.0	24.0	10.0	29.00	....
31	30.24	28.0	30.28	34.0	30.33	27.0	38.0	12.0	26.0	25.00	....

Monthly range	19.24°
Monthly mean	52.00°
Monthly rainfall	1.43

***Snow.**

Meteorological Record for February, 1893.

	8 A. M.		1 P. M.		6 P. M.		24 HOURS ENDING 8 A. M.				
Date.	Barometer.	Thermometer.	Barometer.	Thermometer.	Barometer.	Thermometer.	Maximum Thermometer.	Minimum Thermometer.	Daily Range.	Daily Mean.	Rainfall.
1	30.38	20.0°	30.34	33.0°	30.33	30.5°	34.0°	19.0°	15.0°	26.50°	0.26
2	30.30	29.0	30.35	34.0	30.36	29.0	35.0	26.0	9.0	30.50	0.04
3	30.24	29.0	30.04	27.0	30.03	18.0	33.0	15.0	18.0	24.00	0.16
4	30.27	15.0	30.40	16.0	30.53	11.5	17.5	1.0	18.5	8.25	....
5	30.08	2.5	29.70	14.0	30.69	12.5	22.0	2.5	19.5	12.25	....
6	30.53	22.0	30.33	32.0	30.11	38.0	43.0	22.0	21.0	32.50	0.28
7	29.82	42.0	29.85	44.0	30.04	29.5	47.0	7.0	40.0	27.00	....
8	30.54	10.0	30.56	19.0	30.56	15.5	20.0	10.0	10.0	15.00	....
9	30.68	15.0	30.68	27.0	30.58	27.0	43.0	15.0	28.0	29.00	0.46
10	29.80	43.0	19.65	47.0	29.66	43.0	48.0	33.0	15.0	40.50	0.17
11	29.99	34.0	30.03	40.0	30.08	33.0	41.0	23.0	18.0	32.00	....
12	30.48	25.5	30.58	35.0	30.60	28.0	36.0	25.0	11.0	30.50	....
13	30.54	31.0	30.48	34.0	30.25	33.0	35.0	30.0	15.0	32.50	1.20
14	30.22	35.0	30.29	42.0	30.20	33.5	43.0	31.0	12.0	37.00	....
15	29.85	40.0	29.80	48.0	29.79	44.5	49.0	27.0	22.0	38.00	....
16	29.93	33.0	29.91	37.0	29.92	34.0	40.0	9.0	31.0	24.50	....
17	30.33	12.0	30.34	23.0	30.27	17.5	25.0	11.0	14.0	18.00	0.38
18	29.63	25.0	29.60	28.0	29.61	22.0	29.0	9.5	19.5	19.25	0.08
19	29.65	17.0	29.60	32.5	29.49	25.0	34.0	11.0	23.0	22.50	0.08
20	29.01	14.0	29.11	20.0	29.41	12.0	22.0	1.0	21.0	11.50	0.01
21	29.92	8.0	30.00	22.0	29.99	18.0	28.0	7.5	20.5	17.75	0.36
22	29.25	32.0	28.97	30.5	29.07	22.0	36.0	17.0	19.0	26.50	0.66
23	29.71	23.0	29.71	32.0	29.67	29.0	32.0	21.0	11.0	26.50	0.25
24	29.37	21.0	29.46	35.0	29.59	23.0	35.0	9.0	26.0	22.00	....
25	29.84	18.0	29.63	30.0	29.60	30.0	36.0	17.5	18.5	26.75	0.21
26	29.90	29.0	29.97	35.0	30.01	24.5	39.0	14.0	25.0	26.50	....
27	30.16	23.0	30.14	29.0	30.14	27.0	31.0	15.0	16.0	23.00	....
28	30.30	24.0	30.27	39.0	30.18	31.0	40.0	24.0	16.0	32.00	0.33

Monthly range	49.0°
Monthly mean	25.26°
Monthly rainfall.	4.93

Meteorological Record for March, 1893.

	8 A. M.		1 P. M.		6 P. M.		24 HOURS ENDING 8 A. M.				
Date.	Barometer.	Thermometer.	Barometer.	Thermometer.	Barometer.	Thermometer.	Maximum Thermometer.	Minimum Thermometer.	Daily Range.	Daily Mean.	Rainfall.
1	29.87	36.0°	29.80	37.0°	29.78	30.0°	38.0°	20.0°	18.0°	29.00°	....
2	29.79	29.0	29 82	29.0	29.80	25.0	30 0	11 0	19.0	20.50	....
3	29.86	23.0	29.80	37.0	29.73	30.5	39 0	23.0	16.0	31.00	0.06
4	29 50	31.0	29.38	30.0	29.38	27.0	33.0	11.5	21.5	22.25	....
5	29.70	22.0	29.73	25 0	29 76	16.0	27.0	10.0	17.0	18.50	....
6	29.99	21.0	30.00	27 0	30.00	25.0	35.0	19.0	16.0	27.00	....
7	29 90	32.0	29.85	41.0	29.84	36.0	43 0	23.0	20 0	33.00	....
8	30.07	34.0	30.07	40.0	29.96	34.5	45.0	30.0	15.0	37.50	0.16
9	29.84	37.0	39.76	41.0	29.71	38.0	42.0	34.0	8.0	38.00	0.78
10	30.14	34.0	30 27	36 0	30.37	34.0	38.0	32 0	6.0	35.00	....
11	30.44	36.0	30 37	38.0	30.26	35.0	41.0	35.0	6 0	38.00	0.06
12	29.80	41.0	29.76	46.5	29.76	40.0	47.0	33.0	14.0	40.00	....
13	29.88	41.0	29.72	48.0	29.93	42.0	49.0	30.0	19.0	39 50	....
14	30.00	39.0	29 98	41.0	29.89	38.0	43 0	35.0	8.0	39.00	0.86
15	29.47	39.0	29.57	35.0	29.68	25.0	45.0	15.0	30.0	30.00	....
16	29.83	19.0	29.89	26.0	30.01	24.0	30.0	14 0	16.0	22.00	....
17	30.19	25.0	30.19	31.0	30.12	30.0	34.0	23.0	11.0	28.50	....
18	29.96	30.0	29.98	34 0	30.02	29.0	35.0	14.0	21.0	24 50	....
19	30.20	22.0	30.22	34.0	30.20	26.0	35.0	18.0	17.0	26.50	....
20	30.37	28.5	30.41	32.0	30.38	28.0	38.0	25.0	13.0	31.50	....
21	30.22	38.0	30.10	45.0	30.01	39.0	46.0	30.0	16.0	38.00	0.01
22	30.19	38 0	30.28	44.0	30.37	36.5	45.0	30.0	15.0	37.50	0.04
23	30.50	29.5	30.52	32.0	30.44	31.0	40.0	30.0	10.0	35.00	0.06
24	29.93	40.0	29.82	50.0	29.72	51.0	56.0	39.0	17.0	47.50	....
25	29.76	50.5	29.80	49.0	29 88	44.0	51.5	35 0	16.5	42.25	....
26	30.05	38.0	30.06	41.0	30.08	34.0	42.0	26.0	16.0	34.00	....
27	30.16	36.0	30 18	39.0	30.15	33.0	41.0	25.0	16.0	33.00	....
28	30.17	32.0	30.21	33.0	30.31	28.0	35.0	20.0	15.0	27.50	....
29	30.52	33.0	30.54	36.0	30.48	33.0	41.0	27.0	14.0	34.00	....
30	30.29	41.0	30.13	48.0	29.94	44.0	51.0	32.0	19.0	41.50	....
31	29.75	44.0	29.78	45.0	29.81	39.5	47.0	30.0	17.0	38.50	....

Monthly range	46 0°
Monthly mean	32.93°
Monthly rainfall	2.03

Meteorological Record for April, 1893.

	8 A. M.		1 P. M.		6 P. M.		24 HOURS ENDING 8 A. M.				
Date.	Barometer.	Thermometer.	Barometer.	Thermometer.	Barometer.	Thermometer.	Maximum Thermometer.	Minimum Thermometer.	Daily Range.	Daily Mean.	Rainfall.
1	29.78	42.0°	29.57	55.0°	29.44	58.0°	58.0°	42.0°	16.0°	50.00°	....
2	29.86	46.5	30.03	40.0	30.14	35.0	47.0	23.0	24.0	35.00	....
3	30.37	37.0	30.28	46.0	30.16	45.0	49.0	36.0	13.0	42.50	....
4	29.82	40.0	29.67	42.0	29.50	42.0	52.0	37.0	15.0	44.50	....
5	29.83	47.0	29.91	48.0	29.97	44.5	49.0	30.0	19.0	39.50	*0.27
6	30.29	38.0	30.40	33.0	30.44	30.0	41.0	21.0	20.0	31.00	....
7	30.57	35.0	30.56	36.0	30.42	31.0	39.0	31.0	8.0	35.00	*0.36
8	29.96	39.0	29.88	48.0	29.73	48.0	52.0	39.0	13.0	45.50	0.23
9	29.90	51.0	29.94	49.5	30.00	45.0	52.0	32.0	20.0	42.00	....
10	30.17	43.0	30.18	45.0	30.16	38.0	47.0	33.0	14.0	40.00	....
11	30.24	46.0	30.32	45.0	30.36	40.0	47.0	31.0	18.0	39.00	....
12	30.45	47.0	30.45	48.0	30.40	43.0	51.0	42.0	9.0	46.50	....
13	30.27	44.0	30.16	48.0	30.04	45.0	58.0	45.0	13.0	51.50	....
14	29.94	58.0	29.88	67.0	29.84	48.0	68.0	38.0	30.0	53.00	0.40
15	29.81	39.0	29.72	36.0	29.70	35.0	42.5	30.0	12.5	37.75	0.43
16	30.02	41.5	30.08	47.5	30.15	39.0	50.0	33.0	17.0	41.50	....
17	30.20	43.0	30.19	43.5	30.09	38.0	49.0	33.0	16.0	41.00	....
18	29.82	48.0	29.74	52.0	29.78	45.0	53.0	32.0	21.0	42.50	....
19	29.92	49.0	29.90	51.0	29.93	47.5	52.0	32.0	20.0	42.00	....
20	29.94	40.0	30.23	41.0	20.22	38.0	43.0	35.0	8.0	39.00	0.72
21	29.92	39.0	29.88	50.0	29.90	43.0	53.0	36.0	17.0	44.50	0.06
22	29.79	40.0	29.75	47.0	29.70	45.0	50.5	35.0	15.5	42.75	0.05
23	29.81	49.5	29.82	53.0	29.83	47.5	56.0	35.0	21.0	45.50	....
24	30.08	48.0	30.10	52.0	30.08	44.5	53.0	39.0	14.0	46.00	....
25	30.07	45.0	30.04	49.0	30.03	48.0	52.0	27.0	15.0	39.50	....
26	30.35	40.0	30.38	45.0	30.40	42.0	48.0	34.0	14.0	41.00	....
27	30.35	40.5	30.26	43.0	30.16	38.0	50.0	37.0	13.0	43.50	0.16
28	30.10	50.0	30.02	58.0	29.90	60.0	62.5	42.0	20.5	52.25	....
29	29.96	56.5	29.88	58.0	29.83	54.0	60.5	45.0	15.5	52.75	....
30	30.03	51.0	30.07	50.0	30.09	48.0	57.0	44.0	13.0	50.50	0.04

Monthly range	47.0°
Monthly mean	43.23°
Monthly rainfall	2.72

*Snow.

Meteorological Record for May, 1893.

	8 A. M.		1 P. M.		6 P. M.		24 HOURS ENDING 8 A. M.				
Date.	Barometer.	Thermometer.	Barometer.	Thermometer.	Barometer.	Thermometer.	Maximum Thermometer.	Minimum Thermometer.	Daily Range.	Daily Mean.	Rainfall.
1	30.22	47.5°	30.24	43.5°	30.18	43.0°	48.0°	40.5°	7.5°	44.25°	0.32
2	30.04	43.5	30.03	45.5	30.04	43.0	48.0	41.0	7.0	44.50	0.25
3	30.08	43.0	30.08	42.0	30.05	42.0	45.0	38.0	7.0	41.50	2.23
4	29.49	43.0	29.38	48.0	29.37	47.0	56.0	43.0	13.0	49.50	0.09
5	29.58	56.0	29.59	58.0	29.66	55.0	61.0	45.0	16.0	53.00	....
6	29.74	58.0	29.75	54.0	29.82	51.0	63.0	39.0	24.0	51.00	0.04
7	30.00	56.0	31.00	51.0	30.00	46.0	62.0	40.0	22.0	51.00	....
8	30.18	62.0	30.19	55.0	30.19	51.5	63.5	39.0	24.5	51.50	....
9	30.26	58.5	30.26	55.0	30.23	56.0	64.0	45.0	19.0	54.50	....
10	30.20	64.0	30.16	76.5	30.11	70.5	77.0	53.0	24.0	65.00	....
11	30.20	75.0	30.18	71.0	30.14	63.0	78.0	51.0	27.0	64.50	....
12	30.05	68.0	29.98	66.0	29.93	60.0	74.0	49.0	25.0	61.50	....
13	29.80	51.0	29.70	50.0	29.63	46.0	51.5	42.5	9.0	47.00	0.53
14	29.61	49.0	29.65	60.0	29.66	52.0	62.0	46.0	16.0	54.00	....
15	29.77	61.0	29.78	56.0	29.80	53.0	63.0	47.0	16.0	55.00	....
16	29.85	55.0	29.83	51.0	29.73	47.0	54.5	46.0	8.5	50.50	1.34
17	29.40	50.5	29.36	57.0	29.36	56.5	64.0	47.0	17.0	55.50	0.09
18	29.40	55.0	29.38	62.0	29.38	56.5	65.5	46.0	19.0	55.50	....
19	29.58	60.0	29.62	64.0	29.71	60.0	67.5	43.0	24.5	56.75	....
20	30.03	66.0	30.01	62.0	29.92	61.0	74.0	53.0	21.0	63.50	....
21	29.79	73.5	29.68	80.0	29.64	74.0	81.0	54.0	27.0	67.50	....
22	29.80	74.0	29.80	75.0	29.78	73.0	76.0	55.0	21.0	65.50	....
23	29.77	76.0	29.70	81.0	29.65	69.0	82.0	60.0	22.0	71.00	....
24	29.80	60.0	29.88	66.0	29.92	66.0	70.0	50.0	20.0	60.00	....
25	30.05	68.0	29.91	69.0	29.83	65.5	70.0	50.0	20.0	60.00	....
26	30.01	60.0	30.01	57.0	30.01	56.0	64.0	50.0	14.0	57.00	0.01
27	30.05	52.0	30.02	53.0	29.91	48.0	55.5	46.0	9.5	50.75	0.52
28	29.80	52.0	29.77	67.5	29.76	60.0	68.5	47.0	21.5	57.75	....
29	29.86	60.5	29.88	62.0	29.83	54.5	64.0	47.0	14.0	55.50	....
30	29.87	61.5	29.90	55.0	29.92	59.0	67.0	48.0	19.0	57.50	....
31	30.17	66.0	30.20	65.0	30.20	60.0	70.0	49.0	21.0	59.50	....

Monthly range	44.0°		
Monthly mean		55.86°	
Monthly rainfall			5.42

Meteorological Record for June, 1893.

	8 A. M.		1 P. M.		6 P. M.		24 HOURS ENDING 8 A. M.				
Date.	Barometer.	Thermometer.	Barometer.	Thermometer.	Barometer.	Thermometer.	Maximum Thermometer.	Minimum Thermometer.	Daily Range.	Daily Mean.	Rainfall.
1	30.30	60.0°	30.29	59.0°	30.25	58.0°	65.0°	48.0°	17.0°	56.50°	....
2	30.28	60.0	30.27	58.0	30.25	58.0	64.0	53.0	11.0	58.50	....
3	30.25	60 0	30.25	61.0	30.23	59.5	69.0	52.5	16.5	65.75	0.08
4	30.16	68.5	30.09	71.5	30.00	68.5	83.0	62.0	21.0	72.50	....
5	29.90	81 0	29.87	85.0	29.85	74.0	86.0	64.0	22.0	75.00	....
6	29.86	81.0	29.82	85.0	29.74	78.0	85.0	65.0	20.0	75.00	0.06
7	30.00	76.0	30 02	76.5	30.03	71.0	77.5	54.0	23.5	65.75	....
8	30.27	75.0	30 27	70.0	30.23	66.0	77.0	54.0	23.0	65.50	....
9	30.21	68.0	30.17	68.0	30.12	60.0	76.0	57.0	19.0	66.50	....
10	30.02	68.0	30.00	64.0	29.95	71.0	79.0	63.0	16.0	71.00	....
11	30.02	78.0	29.98	75.0	29 92	74.0	83.5	62.0	21.5	73.25	....
12	30.00	65.0	30.06	64.0	30.08	58.0	67.0	55.0	12.0	61.00	0.06
13	30.18	63 0	30.20	73.0	30.18	68.0	75.0	59.0	16.0	67.00	0.15
14	30.13	71 0	30.10	71.0	30 02	68.0	78.0	62.0	16.0	70.00	....
15	29.92	78.0	29 90	78 0	29.88	71.5	81.0	56.0	25.0	68.50	....
16	30.10	59.0	30.14	60.0	30.13	58.0	65.5	52.0	13.5	58.75	0 07
17	30.09	54.0	30 04	57 5	30 00	....	68.0	58.5	9.5	63.25	0.16
18	29.93	58.0	29.93	....	29.92	....	72.0	58 0	14.0	65.00	....
19	30.07	68.0	30.09	....	29 99	75.0	79 0	62.0	17.0	70.50	....
20	29.93	73 0	29.90	90.0	29.86	....	90.0	71.5	18.5	80.75	....
21	29.82	80 0	29.78	78.5	29.75	70.0	80.0	59 0	21.0	69.50	....
22	29.76	63.5	29 76	61.5	29.75	57.0	64 0	53.0	11.0	58.50	1.48
23	29.75	56.0	29.78	55.0	29.85	54.5	58.0	54.0	4.0	56.00	1.37
24	29.94	58.0	29.96	55.5	29 97	61.0	71.0	54.0	17.0	62.50	....
25	29.99	61.0	29.95	65.0	29.92	58.5	66.0	53.0	13.0	59.50	....
26	29.84	64.5	29.83	66.5	29.82	67.0	70.0	53.0	17.0	61.50	....
27	29.90	62.0	29.98	65.0	30.02	56.5	73.0	50.0	23.0	61.50	....
28	30.15	58.5	30.16	62.0	30.16	61.5	70.0	47 5	22.5	58.75	....
29	30.15	60.0	30.15	69.0	30.11	66.0	71.0	55.0	16.0	63.00	....
30	30.12	60.0	30.10	67.0	30,07	71.0	73.0	57.0	16.0	65.00	....

Monthly range . . . . 42.5°
Monthly mean . . . . 65.52°
Monthly rainfall 3.43

Meteorological Record for July, 1893.

	8 A. M.		1 P. M.		6 P. M.		24 HOURS ENDING 8 A. M.				
Date.	Barometer.	Thermometer.	Barometer.	Thermometer.	Barometer.	Thermometer.	Maximum Thermometer.	Minimum Thermometer.	Daily Range.	Daily Mean.	Rainfall.
1	30.07	63.5°	30.04	65.5°	29.98	72.5°	76.0°	58.0°	18.0°	67.50°	....
2	29.97	69.5	29.96	71.0	29.93	78.0	78.5	61.0	17.5	69.75	....
3	29.92	69.0	29.90	73.0	29.87	69.0	76.0	64.0	12.0	70.00	....
4	29.85	70.5	29.84	75.0	29.84	76.5	82.0	59.0	23.0	70.50	....
5	29.97	73.5	29.93	75.0	29.90	70.0	78.0	60.0	18.0	69.00	0.15
6	29.81	69.0	29.88	74.0	29.91	74.5	77.0	57.0	20.0	67.00	....
7	30.05	69.0	30.05	77.5	30.05	73.0	78.0	61.0	17.0	69.50	....
8	30.00	73.5	29.95	80.0	29.83	74.5	81.0	68.0	13.0	74.50	0.01
9	29.81	72.0	29.83	80.0	29.84	74.0	82.0	56.0	16.0	69.00	....
10	30.00	64.0	30.02	70.0	30.01	72.0	75.0	55.0	20.0	65.00	....
11	30.14	70.0	30.14	75.5	30.10	74.5	79.0	62.0	17.0	70.50	0.02
12	30.10	69.5	30.05	78.5	30.00	69.5	82.0	63.0	19.0	72.50	....
13	29.84	69.5	29.83	77.0	29.86	69.0	77.5	54.0	23.5	65.75	....
14	29.96	67.0	29.99	68.5	29.98	69.5	72.0	57.0	15.0	64.50	....
15	29.99	70.5	29.95	75.0	29.00	69.0	77.0	66.0	11.0	71.50	....
16	29.74	76.5	29.72	84.0	19.70	90.0	92.0	66.0	26.0	79.00	....
17	29.83	77.5	29.85	79.0	29.84	73.0	80.0	65.5	14.5	72.75	....
18	29.87	75.0	29.87	78.0	29.86	72.0	83.0	66.5	16.5	69.75	....
19	29.83	73.0	29.95	75.0	29.96	74.0	80.0	56.0	24.0	68.00	0.02
20	30.12	67.0	30.12	74.5	30.04	73.0	75.0	58.0	17.0	66.50	....
21	29.95	71.5	29.88	82.0	29.82	85.0	88.0	68.0	20.0	78.00	....
22	29.72	78.5	29.68	84.5	29.61	73.0	87.0	61.0	26.0	74.00	1.32
23	29.66	66.0	29.66	71.5	29.71	64.5	73.0	52.0	21.0	62.50	....
24	29.91	60.0	29.94	68.5	30.00	66.5	70.0	53.0	17.0	61.50	....
25	30.11	65.0	30.08	74.0	30.00	66.0	76.6	62.0	14.0	69.00	0.21
26	29.80	74.5	29.73	75.0	29.69	80.0	85.0	67.5	17.5	76.25	....
27	29.72	70.0	29.81	70.0	29.92	67.5	72.0	56.0	16.0	64.00	....
28	30.12	68.0	30.10	77.0	30.07	79.0	80.0	63.0	17.0	71.50	....
29	30.03	67.5	29.93	69.0	29.90	70.5	72.5	62.0	10.5	67.25	....
30	29.95	72.5	29.95	78.5	29.94	74.0	81.0	61.0	20.0	71.00	....
31	29.94	71.5	29.93	73.5	29.88	72.0	75.0	64.0	11.0	69.50	....

Monthly range	40.0°		
Monthly mean		69.58°	
Monthly rainfall			1.73

Meteorological Record for August, 1893.

	8 A. M.		1 P. M.		6 P. M.		24 HOURS ENDING 8 A. M.				
Date.	Barometer.	Thermometer.	Barometer.	Thermometer.	Barometer.	Thermometer.	Maximum Thermometer.	Minimum Thermometer.	Daily Range.	Daily Mean.	Rainfall.
1	29.86	70.5°	29.85	73.5°	29.82	69.5°	73.5°	60.0°	13.5°	66.75°	....
2	30.03	67.5	30.07	75.5	30.12	73.5	77.0	55.0	22.0	66.00	....
3	30.22	70.0	30.22	74.0	30.13	74.5	75.0	59.0	16.0	67.00	....
4	30.13	71.0	30.12	75.5	30.06	70.0	76.0	60.0	16.0	68.00	0.81
5	29.91	60.0	29.87	62.0	29.90	62.0	65.0	58.0	7.0	62.50	1.09
6	29.92	65.0	29.87	74.5	29.81	66.0	76.0	61.0	15.0	68.50	4.35
7	29.78	67.0	29.74	70.5	29.73	66.0	72.0	57.5	14.5	64.75	0.78
8	29.90	67.5	29.94	74.5	29.94	76.0	77.5	62.0	15.5	69.75	....
9	30.14	75.0	30.15	79.0	30.11	76.5	79.0	65.0	14.0	72.00	....
10	30.11	73.5	30.09	82.0	30.04	80.5	84.0	62.5	21.5	73.25	....
11	30.01	72.0	30.00	72.5	29.93	73.0	74.0	66.5	7.5	70.25	....
12	29.87	70.5	29.87	75.0	29.86	70.5	76.0	61.0	15.0	68.50	0.15
13	29.93	62.0	29.96	69.5	29.99	66.5	71.5	50.0	21.5	60.75	....
14	30.08	59.0	30.04	68.0	29.99	70.0	72.0	55.0	17.0	63.50	....
15	29.95	67.0	29.91	75.5	29.88	71.0	77.5	55.0	27.5	66.25	....
16	29.95	64.5	29.95	68.5	29.96	64.5	69.0	60.0	9.0	64.50	....
17	29.93	64.5	29.90	67.0	29.84	60.5	68.0	61.0	7.0	64.50	0.22
18	29.75	65.0	29.78	64.0	29.82	60.0	65.5	56.0	9.5	60.75	0.03
19	29.93	61.0	29.98	65.5	29.99	61.5	66.5	60.0	6.5	63.25	....
20	30.03	63.5	30.08	65.5	30.04	62.5	68.0	61.0	7.0	64.50	0.67
21	29.88	61.0	29.68	57.5	29.67	60.5	65.0	57.0	8.0	61.00	0.95
22	30.02	65.0	30.08	75.0	30.10	71.0	76.0	59.0	17.0	67.50	....
23	30.26	66.5	30.26	70.0	30.23	68.5	71.0	62.0	9.0	66.50	0.05
24	29.94	65.0	29.77	70.0	29.67	68.5	72.0	65.0	7.0	68.50	0.22
25	29.93	72.0	29.92	82.5	29.90	80.5	86.0	70.0	16.0	78.00	....
26	29.97	75.5	30.00	81.0	30.02	74.0	82.0	66.0	16.0	74.00	....
27	30.10	70.0	30.10	69.5	30.04	68.5	72.5	67.0	5.5	69.75	....
28	30.04	72.5	30.03	80.0	30.00	77.0	83.0	67.0	16.0	75.00	....
29	29.73	68.5	29.55	73.0	29.56	76.0	78.0	59.0	19.0	68.50	0.22
30	29.97	64.0	30.02	70.0	30.05	70.0	71.0	54.0	17.0	62.25	....
31	30.14	63.5	30.12	73.0	30.11	76.0	75.0	53.0	23.0	64.00	....

Monthly range . . . . 33.0°
Monthly mean . . . . 67.15°
Monthly rainfall 9.54

Meteorological Record for September, 1893.

	8 A. M.		1 P. M.		6 P. M.		24 HOURS ENDING 8 A. M.				
Date.	Barometer.	Thermometer.	Barometer.	Thermometer.	Barometer.	Thermometer.	Maximum Thermometer.	Minimum Thermometer.	Daily Range.	Daily Mean.	Rainfall.
1	30.18	61.0°	30.15	63.0°	30.06	60.5°	64.0°	56.5°	7.5°	60.25°	0.33
2	29.88	60.5	29.83	67.0	29.86	62.5	68.0	43.5	24.5	55.75	....
3	30.01	52.0	29.96	61.5	29.88	58.5	65.0	49.0	16.0	57.00	....
4	29.88	52.5	29.89	59.0	29.89	60.0	62.0	46.0	16.0	54.00	....
5	29.93	60.0	29.85	70.0	29.76	69.5	74.0	58.0	16.0	66.00	....
6	29.91	63.0	29.95	65.0	29.95	60.5	66.0	45.0	21.0	55.50	....
7	30.12	64.0	29.92	63.0	29.89	63.5	65.0	53.0	12.0	59.00	0.38
8	29.90	56.0	29.97	61.0	30.01	60.5	63.0	48.0	15.0	55.50	....
9	30.15	61.0	30.14	65.0	30.09	60.0	68.0	51.5	16.5	59.75	....
10	30.00	61.0	29.96	70.0	29.96	67.5	72.0	46.0	26.0	59.00	....
11	30.25	53.0	30.27	60.5	30.26	55.0	60.0	44.0	16.0	52.00	....
12	30.35	54.5	30.35	65.0	30.32	62.0	66.0	45.0	21.0	55.50	....
13	30.35	56.5	30.32	65.0	30.27	64.0	66.0	53.0	13.0	59.50	....
14	30.25	63.0	30.24	71.5	30.20	67.0	73.0	60.0	13.0	66.50	....
15	30.12	64.0	30.06	73.0	29.97	68.0	77.5	62.5	15.0	70.00	....
16	29.72	67.0	29.64	72.5	29.65	56.5	72.0	48.0	24.0	60.00	0.56
17	29.76	53.5	29.76	63.0	29.80	55.5	63.0	49.0	14.0	56.00	....
18	29.88	56.0	29.89	63.5	29.87	61.0	64.0	55.0	9.0	59.50	....
19	29.75	61.5	29.69	66.0	29.68	64.0	68.0	55.0	13.0	60.50	0.10
20	29.77	65.0	29.76	70.0	29.81	62.0	76.0	43.0	33.0	59.50	....
21	30.00	50.0	30.00	58.5	29.99	58.0	75.0	45.0	30.0	60.50	....
22	30.00	55.0	29.89	63.0	29.85	60.0	63.0	54.0	9.0	58.50	0.01
23	29.90	61.0	29.89	64.5	29.89	61.0	67.5	52.0	15.5	59.75	0.01
24	29.96	57.0	30.00	65.0	30.06	58.5	67.0	53.0	4.0	60.00	....
25	30.07	59.0	29.92	59.5	29.82	62.5	64.0	45.0	19.0	54.50	0.08
26	30.21	49.0	30.27	56.0	30.28	52.5	56.0	45.0	11.0	50.50	....
27	30.30	49.0	30.27	53.0	30.26	51.0	55.0	44.0	11.0	49.50	....
28	30.16	52.0	30.12	55.0	30.08	50.0	56.0	45.0	11.0	50.50	....
29	30.05	48.0	30.04	50.0	30.03	45.0	51.0	41.0	10.0	46.00	....
30	30.05	48.0	30.00	62.0	29.96	54.0	66.0	43.0	23.0	54.50	....

Monthly range	36.5°
Monthly mean	57.48°
Monthly rainfall	1.47

Meteorological Record for October, 1893.

	8 A. M.		1 P. M.		6 P. M.		24 HOURS ENDING 8 A. M.				
Date.	Barometer.	Thermometer.	Barometer.	Thermometer.	Barometer.	Thermometer.	Maximum Thermometer.	Minimum Thermometer.	Daily Range.	Daily Mean.	Rainfall.
1	29.76	47.0°	29.66	57.0°	29.68	50.0°	57.0°	47.0°	10.0°	52.00°	....
2	29.81	53.5	29.86	58.5	29.90	54.0	73.0	46.0	27.0	59.50	....
3	30.06	55.0	30.08	55.0	30.08	52.0	65.0	57.0	14.0	58.00	....
4	30.04	52.5	29.99	55.0	29.98	52.5	56.5	51.0	5.5	53.75	....
5	30.01	56.5	30.00	62.0	30.01	57.5	72.5	49.0	23.5	60.75	....
6	30.12	56.0	30.14	60.0	30.10	55.0	73.0	54.0	19.5	63.50	....
7	30.04	56.0	29.98	66.0	29.94	62.5	82.0	52.0	30.0	67.00	....
8	30.05	54.5	30.02	64.5	30.00	58.5	85.0	49.0	36.0	67.00	....
9	29.90	55.0	29.70	68.0	29.65	70.0	84.0	46.0	38.0	65.00	....
10	29.94	50.0	29.96	57.5	30.04	55.0	67.0	43.0	24.0	55.00	....
11	30.23	50.0	30.23	57.5	30.20	54.5	77.0	44.0	33.0	65.50	....
12	30.23	50.5	30.21	63.0	30.17	58.0	75.0	47.0	28.0	61.00	....
13	30.16	57.0	30.12	60.0	30.07	57.0	66.5	56.0	10.5	61.50	0.38
14	29.59	66.5	29.44	68.0	29.44	61.0	78.0	49.5	28.5	63.75	0.71
15	29.70	52.5	29.73	59.0	29.84	55.0	59.5	40.0	19.5	44.50	....
16	30.12	45.5	30.17	48.0	30.24	45.0	50.0	33.0	17.0	42.50	....
17	30.37	41.5	30.36	53.5	30.30	52.0	75.0	42.0	33.0	58.50	....
18	30.41	49.0	30.44	50.0	30.46	45.0	58.0	36.0	22.0	47.00	....
19	30.54	41.0	30.56	49.0	30.55	48.5	50.0	41.0	9.0	45.50	...
20	30.48	48.5	30.42	52.5	30.34	51.5	71.0	47.5	23.5	59.50	...
21	30.24	54.0	30.18	57.5	30.17	60.0	80.0	47.5	32.5	63.75	....
22	30.33	52.5	30.35	61.5	30.36	53.0	67.0	50.0	17.0	58.50	....
23	30.37	54.0	30.35	58.0	30.29	56.0	59.0	53.0	6.0	56.00	2.00
24	29.94	59.0	29.84	66.0	29.82	63.0	77.5	55.0	22.5	66.50	0.05
25	29.84	59.0	29.86	65.0	29.92	54.0	72.0	40.0	32.5	56.00	....
26	30.20	45.0	30.24	48.0	30.24	45.0	60.0	42.5	17.5	51.25	....
27	30.19	50.5	30.11	55.0	30.06	56.5	59.0	51.0	8.5	55.00	0.27
28	29.78	59.0	29.77	60.0	29.78	52.0	70.0	39.0	31.0	54.50	0.01
29	29.94	40.5	29.95	47.5	30.02	43.5	53.0	32.0	21.0	42.50	....
30	30.30	36.0	30.33	42.5	30.34	40.0	57.0	28.0	29.0	42.50	....
31	30.37	33.0	30.38	41.5	30.37	37.5	55.0	32.0	23.0	43.50	....

Monthly range . . . . 47.0°
Monthly mean . . . . 56.06°
Monthly rainfall . . . . 3.42°

Meteorological Record for November, 1893.

	8 A. M.		1 P. M.		6 P. M.		24 HOURS ENDING 8 A. M.				
Date.	Barometer.	Thermometer.	Barometer.	Thermometer.	Barometer.	Thermometer.	Maximum Thermometer.	Minimum Thermometer.	Daily Range.	Daily Mean.	Rainfall.
1	30.37	38.0°	30.32	52.0°	30.28	48.0°	62.0°	37.5°	24.5°	49.75°	....
2	30.25	45.0	30.20	57.5	30.14	52.5	68.0	45.0	23.0	56.50	....
3	30.00	64.0	29.94	64.0	29.97	55.0	67.0	39.0	28.0	53.00	....
4	30.08	43.5	30.10	45.0	30.08	40.0	48.0	34.0	14.0	41,00	0.62
5	30.18	36.0	30.21	44.0	30.23	40.5	45.0	34.0	11.0	44.50	....
6	30.20	42.5	30.18	51.5	30.22	46.5	60.0	33.0	27.0	46.50	....
7	30.42	38.0	30.44	46.0	30.44	43.5	47.0	33.0	14.0	40.00	....
8	30.41	41.0	30.34	51.0	30.25	47.0	51.0	40.0	11.0	45.50	....
9	30.04	44.0	30.02	49.0	30.05	44.5	51.5	27.0	24.5	39.25	....
10	30.27	30.0	30.31	37.0	30.32	35.0	48.0	28.0	20.0	38.00	....
11	30.34	35.0	30.34	47.0	30.35	42.0	48.0	35.0	13.0	41.50	....
12	30.41	38.0	30.41	45.0	30.38	44.0	47.0	37.5	9.5	42.25	....
13	30.20	46.5	30.10	53.0	30.05	52.0	54.0	41.0	13.0	47.50	....
14	30.00	44 0	29.97	52.0	29 92	48.0	54.0	41.5	12.5	47:75	0.11
15	29.72	41.0	29.55	43.0	29.54	38.0	44.0	27.0	17.0	35.50	0 07
16	29.65	30.0	29.70	35.0	29.86	34.0	40.0	27.5	12.5	33.75	....
17	30.09	34.5	29.78	50.0	29.92	48.0	52.0	35.0	17.0	43.50	....
18	29.82	48.0	29.77	55.0	29.85	42.0	55.0	32.0	23.0	43.50	....
19	30.02	35.0	29.99	40.0	29.94	38.0	40.0	30.5	9.5	35.25	....
20	29.90	32.0	29.92	37.0	29.98	32.5	39 0	25.0	14.0	32.00	*0.01
21	30.11	30.0	30.12	40.0	30.08	38.0	47.0	30 0	17.0	38.50	0.50
22	29.70	47.0	29.57	53.0	29.63	44.0	55.0	39.0	16.0	47.00	....
23	29.73	40.0	29.75	47.0	29.72	43.5	47.5	35.0	12.0	41.00	....
24	29.64	35.0	29.62	40.0	29.72	34.5	40.0	25.0	15.0	32.50	....
25	30.04	27.0	30.12	32.0	30.22	30.0	31.5	22.0	9.5	26.75	....
26	30.42	23.0	30.52	27.0	30.58	23.5	28.0	18.0	10.0	23.00	....
27	30 60	23.5	30.58	36.0	30.49	39.0	47.5	23.5	24.0	35.50	0.28
28	29.80	47.5	29.64	57.0	29.64	52.0	57.0	39 0	18.0	48.00	....
29	29.96	42.5	29.97	47.0	29.93	45.5	50.0	43.5	6.5	46.75	....
30	29.72	47.0	29.78	48.0	29.84	42.5	50.0	35.0	15.0	42.50	....

Monthly range	50.0°
Monthly mean	41.20°
Monthly rainfall	1.59

*Snow.

Meteorological Record for December, 1893.

	8 A. M.		1 P. M.		6 P. M.		24 HOURS ENDING 8 A. M.				
Date.	Barometer.	Thermometer.	Barometer.	Thermometer.	Barometer.	Thermometer.	Maximum Thermometer.	Minimum Thermometer.	Daily Range.	Daily Mean.	Rainfall.
1	29.85	42.0°	29.78	43.0°	29.72	36.0°	45.0°	23.0°	12.0°	34.00°	0.35
2	30.08	23.0	30.19	29.0	30.17	26.0	30.0	23.0	17.0	26.50	*0.25
3	30.22	30.0	29.88	39.5	29.70	38.0	42.0	28.0	14.0	35.00	1.54
4	29.85	30.0	29.97	25.5	30.18	21.0	30.0	13.0	17.0	21.50	....
5	30.41	17.0	30.34	17.5	30.12	18.0	26.0	17.0	9.0	21.50	*0.57
6	30.13	24.0	30.21	36.0	30.23	33.0	37.0	23.5	13.5	30.25	....
7	30.27	32.0	30.23	41.0	30.22	40.0	43.0	22.0	21.0	32.50	....
8	30.35	24.0	30.43	35.0	30.41	32.0	36.0	24.0	12.0	30.00	....
9	30.33	30.5	30.21	41.0	30.10	38.0	41.0	31.0	10.0	36.00	0.34
10	29.78	38.0	29.73	43.5	29.73	39.5	45.0	23.0	22.0	34.00	....
11	30.07	23.0	30.11	23.0	30.22	20.0	24.0	15.0	9.0	19.50	....
12	29.98	20.0	29.90	19.0	29.97	27.0	29.0	3.0	26.0	16.00	*0.03
13	30.36	5.0	30.47	11.0	30.55	7.0	12.0	3.0	15.0	4.50	....
14	30.77	2.0	30.82	13.0	30.76	17.0	29.0	2.0	31.0	13.50	*0.20
15	30.55	20.0	30.29	27.0	30.24	27.0	29.0	20.0	9.0	24.50	*0.35
16	29.90	27.0	29.72	30.0	29.51	35.0	37.5	26.5	11.0	32.00	0.72
17	29.55	37.5	29.60	40.0	29.72	31.5	40.0	14.0	26.0	27.00	....
18	29.90	14.0	29.94	27.0	29.94	25.0	36.0	14.0	22.0	25.00	*0.05
19	29.81	36.0	29.70	40.5	29.70	39.0	42.0	24.0	18.0	33.00	....
20	30.05	24.0	30.15	23.0	30.30	20.5	26.0	17.0	9.0	21.50	....
21	30.26	26.0	30.18	37.5	30.10	37.0	40.0	26.0	14.0	33.00	....
22	30.26	35.0	30.35	35.5	30.40	36.0	40.5	33.0	7.5	36.75	0.03
23	30.20	40.5	30.07	49.0	30.05	42.5	49.0	36.0	13.0	42.50	....
24	30.23	39.0	30.18	47.0	30.10	46.0	48.0	39.0	9.0	43.50	....
25	30.04	43.5	29.84	50.0	29.75	45.0	50.5	26.0	14.5	38.50	....
26	29.86	26.0	30.02	27.0	30.15	18.5	27.0	15.0	12.0	21.00	....
27	30.08	25.0	30.06	32.0	29.96	30.0	34.0	25.0	9.0	34.50	....
28	29.87	32.0	29.74	36.0	29.62	40.0	41.0	32.0	9.0	36.50	....
29	29.55	41.0	29.54	45.5	29.65	40.5	45.0	31.0	14.0	38.00	0.06
30	30.03	31.0	30.09	32.0	30.08	28.5	33.0	16.0	7.0	24.50	*0.15
31	30.06	20.0	30.03	28.5	30.05	25.5	29.0	16.5	12.5	22.00	*0.07

Monthly range	53.5°
Monthly mean	28.66°
Monthly rainfall	4.71

*Snow.

SUMMARY OF STATISTICS.

Report of 1893.

LYNN WATER WORKS, LYNN, MASS.

Popoulation by census of 1890, both Lynn and Saugus,	59,400
Date of construction,	1870 to 1872
Owned by,	City of Lynn.
Source of supply,	Four artificial storage basins, formed by constructing dams across the valleys of four brooks, Saugus River taken direct.
Mode of supply,	By gravitation to the pump well, and pumped thence to a distributing reservoir at an elevation of 177 feet above mean high tide by one Leavitt engine, built by J. P. Morris & Co., of Philadelphia, of 5,000,000 daily capacity, and one Loretz engine of 10,000,000 daily capacity.
1. Kind of coal used,	George's Creek Cumberland.
2. Cost of coal,	$4.50 (2,000 lbs.) delivered.

	Leavitt.	Loretz.
3. Coal consumed for the year, in pounds,	958,817	809,783
4. Pounds of wood consumed in pounds coal,	433	517

	Leavitt.	Loretz.
5. Total coal consumed for the year,	959,250	810,300
6. Total pumpage for the year, in gallons,	752,691,940	610,018,750
7. Average dynamic head against which pump works,	161.53	158.95
8. *a.* Number of gallons pumped per pound of coal,	784.60	752.60
b. Number of gallons raised 100 feet per pound of coal,	1,267.36	1,196.26
9. Duty, in foot pounds per 100 pounds of coal, no deductions, $\text{Duty}=\frac{\text{gallons pumped(4)}\times 8.34\times 100\times\text{dynamic head(5)}}{\text{total coal consumed}}$	105,659,538	99,736,937

COST OF PUMPING, FIGURED ON PUMPING STATION EXPENSES, VIZ., $9,481.46.

10. Per million gallons raised against average dynamic head (5) into reservoir,	$6.94
11. Per million gallons raised one foot high (dynamic),	4.32 cents

COST OF PUMPING, FIGURED ON TOTAL MAINTENANCE, VIZ., $112,735.67.

12. Per million gallons raised against dynamic head (5) into reservoir,	$82.50
13. Per million gallons raised one foot high (dynamic),	51.35 cent

FINANCIAL.

MAINTENANCE.

RECEIPTS.		EXPENDITURES.	
From consumers:			
A. Water rates, domestic,	$134.320.61	AA. Management and repairs,	$38,707.17
B. Water rates, manufacturing,	40,616 97	BB. Interest on bonds,	74,028.50
C. Net receipts, for water,	$174,937.58	CC. Total maintenance,	$112,735.67
D. Repairs and sundries,	2.191.48	DD. Balance carried to sinking fund,	64,393.39
E. Total from ordinary consumers,	$177,129 06		
F. From public funds, general appropriation,	20,000.00		
G. Gross receipts from all sources,	$177,129.06	EE. Total,	$177,129.06

CONSTRUCTION.

RECEIPTS.		EXPENDITURES.	
F. From balance of 1892,	$12,042.88	FF. Extension of main lines,	$23,134.89
G. Appropriations bonded,	140,000.00	GG. Extention of service pipes,	11,796.27
H. Pipes, meters and labor,	8,742.14	HH. Meters,	4,364.09
		II. Account Loretz engine,	645.65
		JJ. Account ponds, Saugus River and land bought.	80,197.29
		LL. Total construction for year	$119,493.14
		MM. Balance,	41,291.88
I. Total,	$160,785.02	NN. Total,	$160,785.02

J.	Net cost of works to date . . .	$2,096,350.35
K.	Bonded debt, Dec. 31, 1893 . . .	1,725,300.00
L.	Value of sinking fund . . .	312,973.31
M.	Rate of interest . . .	3½, 3¾, 4, 4½, 5, 6,

CONSUMPTION.

Estimated population to date (Lynn and Saugus),	69,653
Estimated population supplied,	66.850
Total number of gallons consumed for the year,	1,366,471,699
No. of gallons metered,	213,400,000
Average daily consumption in gallons,	3,743,758
Gallons per day to each consumer,	56

DISTRIBUTION.

Kind of pipe used,	Wrought iron cement-lined and cast-iron
Size,	From 2 to 20 inches in diameter
Extended,	3 miles, 865 feet
Total now in use,	106 miles, 2062 feet
Total now in use,	Lynn, Saugus, Swampscott, 120 miles, 810 feet
Number of leaks for the year	119
Hydrants added,	26
Hydrants now in use,	773
Gates added,	22
Gates now in use,	914
Range of pressure of city for day and night	50 to 65 pounds

SERVICES.

Kind of pipe used,	iron, cement-lined adamanta and galvanized iron
Size of pipe used,	¾ to 10 inches in diameter
Extended,	24,275
Discontinued,	2,162
Number of services added,	476
Number of services discontinued,	47
Number of services now in use,	10,577
Total length of services,	85 miles, 462 feet
Number of services added in Saugus,	86
Number of services now in use in Saugus,	526
Length of services added in 1893,	4,389 feet
Total length of services in Saugus,	5 miles, 1,105
Meters added,	175
Meters now in use,	669

L. W.
x

B'D. JAN 16 19[illegible]